ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 24. No. 26. WEEKLY. | NEW YORK, WEDNESDAY, JUNE 27, 1894. | $3 per Annum. Single Copies, 10 Cents.

Copyright, 1894, by ELECTRICAL REVIEW PUBLISHING COMPANY, 13 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

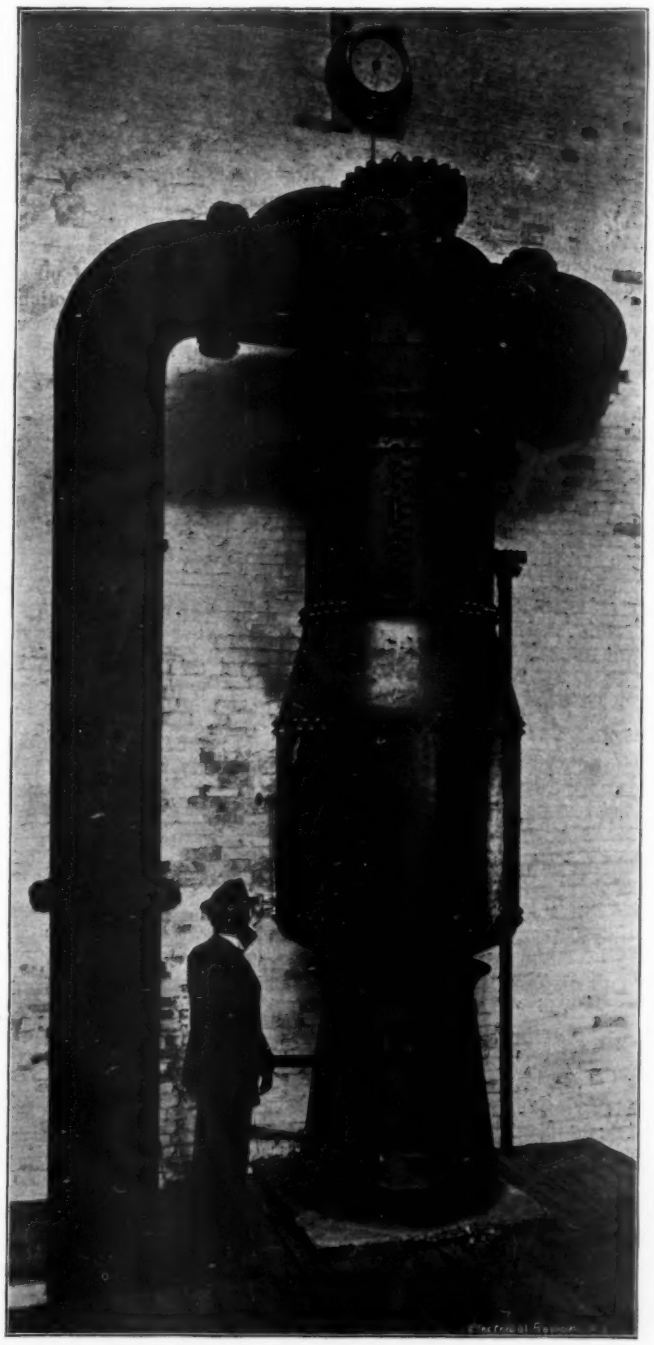
A Philadelphia trolley car conductor was a good deal astonished the other day when, upon approaching a fashionably dressed woman passenger for her fare, she handed him, along with five cents, a card bearing the inscription: "In case of my death please have my remains taken to ——," mentioning number and street. He presumed she was deaf and dumb, and would have remained of that opinion had she not pointed to her throat and huskily whispered "cold" as she bowed her thanks when he stopped the car near the street indicated on the card.

A Cincinnati electric lighting company has daily followed the custom of putting out some quotation in poetry or philosophic observation from some great author on a bulletin board in front of its plant near the court house. Recently it had one on the lawyers that set the town laughing. The name of the author is not remembered, but the quotation ran: "An apothecary differs from a lawyer in that the latter has no scruples." It quickly spread through the court house and was greatly appreciated.

The German Government have decided to paint their torpedo-boats bluish-grey, this color being, they consider, the least visible under the electric light.

The Newark, N. J., Electric Light and Power Company, without securing permission, started the other day to erect an electric light pole on the property of Mrs. Dunn. Miss Dunn objected, but the men paid no attention. Finally she took a chair and, placing it over the excavation which was being made, sat upon it and stubbornly refused to move. The foreman then went in front of the building next door and began to dig another hole for the pole. The women objected there, and the foreman told the women there that if they went to the office of the company that the work would be stopped. A delegation of women went to the office of the company and were referred to the office of the Street and Water Commissioners. When they got back home they found the pole up and the light burning.

The Johnson Company, of Johnstown, Pa., the great rail manufacturers, are now making street car trucks.



ONE OF THE GOUBERT MANUFACTURING COMPANY'S 18 INCH STRATTON SEPARATORS FURNISHED TO THE PHILADELPHIA TRACTION COMPANY.

The Stratton Separator.

The Philadelphia Traction Company were recently supplied by the Goubert Manufacturing Company, 32 Cortlandt street, New York, with two 18 inch, two 16 inch and two eight inch Stratton separators besides six Goubert feed-water heaters of 2,000 horse-power each, the whole aggregating 12,000 horse-power. The illustration on this page shows one of the 18 inch Stratton separators, the man standing beside it affording a convenient comparison of its size.

Dry steam, as is well known, is the foundation of economy in the operation of any power plant. It is the mission of the Stratton separator to mechanically separate the water from the steam and send along the latter for service in a dry state.

The Stratton separator is based on the principle that, if a rotative motion is imparted to the steam, all the liquid particles it may contain, being heavier than the steam, acquire centrifugal force and are projected to the outside of the current. The separator consists of a vertical cylinder with an internal central pipe extending from the top downward, for about half the height of the apparatus, leaving an annular space between the two.

A nozzle for the admission of the steam is on one side, the outlet being on the opposite side or on top as may be most convenient in making the connections. The lower part of the apparatus is enlarged to form a receiver of considerable capacity, thus providing for a sudden influx of water from the boiler. A suitable opening is tapped at the bottom of the apparatus for a drip connection, and a glass water gauge shows the level of the water in the separator at all times.

The current of steam on entering is deflected by a curved partition and thrown tangentially to the annular space at the side near to top of the apparatus. It is thus whirled around with all the velocity of influx, producing the centrifugal action which throws the particles of water against the outer cylinder. These adhere to the surface, so that the water runs down continuously in a thin sheet

around the outer shell into the receptacle below, while the steam following a spiral course to the bottom of the internal pipe abruptly enters it, and in a now dry condition passes upward and out of the separator, without having once crossed the stream of separated water, all danger of the steam taking up again such water after separation being entirely avoided.

The New Fall River Boat "Priscilla."

The trial trip of the Fall River Line steamer "Priscilla" occurred on June 21. At the invitation of General Passenger Agent O. H. Taylor, of the Old Colony Steamboat Company, 1,032 guests enjoyed the trip from the pier at the foot of Murray street to Scotland Lightship and return. The run from the Battery to Scotland Lightship, a distance of 21 miles, was made in 58 minutes. In the evening the "Priscilla," ablaze with electric lights, lay at her pier and was inspected from 7 to 10.30 o'clock by many hundreds more invited guests.

The "Priscilla" is built of steel and cost $1,500,900, and she is licensed to carry 1,500 passengers. She is said to be the largest and most luxuriously furnished steamboat afloat. She is 440½ feet long, 52½ feet wide, draws 12 feet of water and has a registered tonnage of 5,398. The "Priscilla" has a double-inclined compound engine of 8,500 horsepower. She has two high pressure cylinders 51 inches in diameter and two low pressure cylinders 95 inches in diameter. The electrical equipment of the "Priscilla" was described and illustrated in the ELECTRICAL REVIEW for May 9, 1894.

The Thomson Portable Recording Watt-Meter.

The latest development in the electrical meter line is the new Thomson portable recording watt-meter, which, identical in general character with the standard meter of that type, is constructed with special provision for transportation from place to place, and for use in places where it is exposed to jarring and rough shaking. While it may, of course, be used for any and all classes of testing work in which a portable recording meter is requisite, its special use is for the testing of street car work and in this field it will be found most valuable.

The meter is mounted on a skeleton frame suspended between strong elastic rubber nettings within the case. Detrimental shocks and vibrations become absorbed in these nettings, and no interference with the movement of the meter occurs. Its accuracy is unaffected, even when placed on the floor of a rapidly moving car. The meter is mounted in a handsome polished wood case. The 25 ampere size will be found the most suitable for general car testing, as it will stand and accurately record extreme overloads for short intervals.

This meter is the result of long and careful experiment on the part of the General Electric Company. It should not be confounded with the rigidly mounted and bulky portable meters formerly used for car testing in default of a superior device. This meter is said to be the only portable recording watt-meter on the market and is the outcome of an important demand from the street car companies for a meter which would enable them to check the efficiency of every car equipment and the average number of horse-power hours needed to take any car over any route of their systems. They are manufactured in the following sizes:

Three amperes, one and one-half horse-power; 15 amperes, seven and one-half horse-power; 25 amperes, 15 horse-power; 50 amperes, 30 horse-power; all for 500 volt circuits. They can also be made for any other voltage, according to order.

THOMSON PORTABLE RECORDING WATT-METER.

Perry Manufacturing Company's Power Transmitters.

The Perry Manufacturing Company, of Boston, is the title of the new concern who have succeeded to the business of the L. P. and D. Transmitter Company, the present firm being composed of Fred. H. Perry, D. G. Kemp and A. J. Howe. Under the new arrangement the business will be pushed with increased vigor, and as a first step two new machines have just been put on the market. They are styled "Special B" and "Class D" and have been built to fill a special demand.

"Special B," as will be seen from the illustration, is of entirely new design, and is intended for use where it would be impossible to place a two sided machine. It is provided with a self-oiling loose pulley, which is perfect in its operation, always keeping a continuous flow of oil through the bearings when in motion. The machine is capable of setting up close to any pulley regardless of foundation such as would prohibit the use of the two sided or standard type.

"Class D," or the double pulley machine, is designed and intended for heavy duty, being built in such a manner as to engage more of the periphery of the driving pulley, getting about the same as the ordinary or old method of belting, and is advised only when the power transmitted is too great for the standard "B" or "C," which rarely occurs.

These machines are put on the market in response to a distinct demand, which has arisen from the peculiar necessities of central station men, owing to the various construction of the engines in use, and are guaranteed to thoroughly accomplish the results for which they are intended.

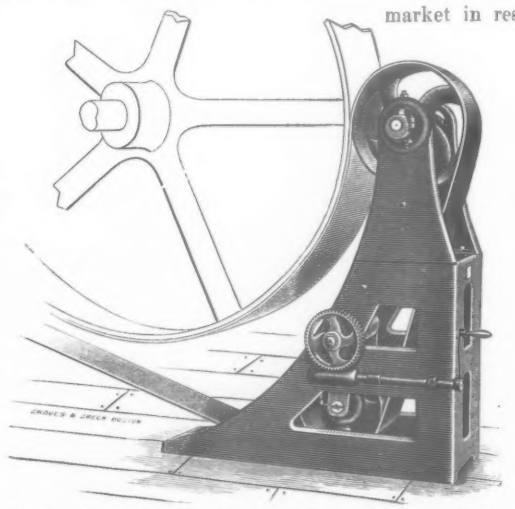


FIG. 1.—PERRY MANUFACTURING COMPANY'S "CLASS D" POWER TRANSMITTER.

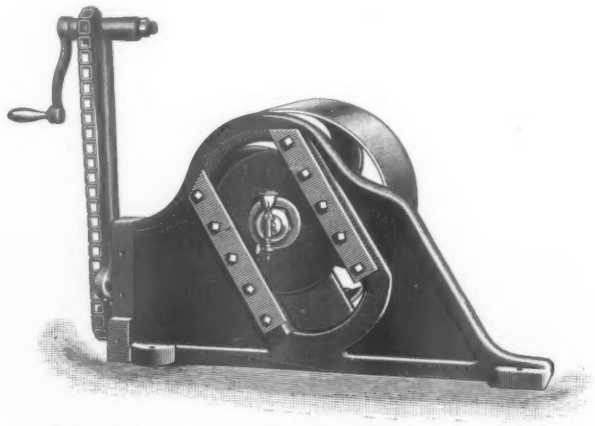


FIG. 2.—PERRY MANUFACTURING COMPANY'S "SPECIAL B" POWER TRANSMITTER.

THE TELEPHONE COMPANY WINS.

IMPORTANT CASE AGAINST THE CENTRAL PENNSYLVANIA COMPANY —INTERESTING TESTIMONY— A NEW DEFINITION FOR ELECTRICITY.

In September, 1889, Dr. Hand, of Scranton, Pa., was driving a horse and buggy in the city of Scranton. The day was wet and stormy. The horse ran into a small wire which hung down over the guy or span wire of the electric road, and which was imperfectly insulated from the trolley wire. The horse dropped dead with the wire under him. Dr. Hand, claimed he jumped out of his buggy, and in trying to raise his horse by the bridle, received a shock which stunned him, leaving his right arm partially paralyzed. Four years later the doctor brought suit against the Central Pennsylvania Telephone and Supply Company, also, against the Electric Street Car Company, and against the city of Scranton, claiming damages to the amount of $50,000.

The case against the telephone company was begun in the Scranton court, June 7, 1894, and for 11 days was fought out by some of the ablest lawyers in that section.

Intense interest was manifested in the case. Lawyers and physicians crowded the court room day after day.

Thomas D. Lockwood, of Boston, gave valuable expert testimony and was ably seconded by Dr. J. Emmet O'Brien, who, besides testifying as a medical expert, showed himself to be in touch with the advanced electrical men of the day. Arthur Lewis, an electrician of local fame, gave interesting experience as to the resistance of men and horses.

These, with many other electricians present, were unanimous in their belief that Dr. Hand did not receive any injury from the electric current and could not under the conditions claimed by him.

Richard O'Brien, of the Western Union Telegraph Company, on sharp cross-examination by the doctor's council, defined electricity as "A God like force which abhors all sham conductors."

The charge of Judge Archbald was a very exhaustive, able and impartial one.

The jury, after six hours' consideration, rendered a verdict in favor of the telephone company.

The Kennelly Combination Galvanic and Faradic Adaptor.

One of the most urgent inquiries of the physician of to-day is for an instrument which he can use with the Edison 110 or 120 volt direct current for all the varied forms of electro-therapeutic treatment with absolute safety to the patient, and at the same time be able to graduate and control it within the finest limits, and also accurately measure the strength of the current he is employing. Such an apparatus is illustrated on this page and has been designed by Mr. A. E. Kennelly, late chief electrician of the Edison laboratory, with a special view of fulfilling all these requirements.

It consists of a hard rubber cylinder, upon which is wound in suitable grooves, cut on the face of same, several hundred feet of german silver wire, having a very high resistance. Near the end of the cylinder on the left very high resistance carbon blocks are introduced into the circuit, making the total resistance about 33,000 ohms. This rheostat is regulated by the sliding contact which travels along the two rods above and parallel with the cylinder.

A 16 candle-power lamp is placed in circuit with each of the leading-in wires to effectually protect the patient and apparatus should a short circuit occur on any part of the electric light circuit.

A third lamp, shown on the extreme right, provided with a key, is arranged in shunt with the rheostat. When the key is turned on the voltage of the galvanic current is reduced to 60 volts. With this shunt in operation, and all the resistance of the rheostat thrown into the circuit by moving the sliding contact to the extreme left, a current of one milliampere is obtained when the binding posts are connected together by a short piece of wire, *i. e.*, short-circuited. On moving the sliding contact to the right, the resistance is very gradually diminished and the current correspondingly increased. This finely graduated current is required in some cases, where a very slight irregularity in the current would produce a shock to the patient. When a stronger current is required the lamp is cut out by turning off the key and the current is used unshunted.

The well-known Kennelly milliammeter is mounted on the base on the left, the pole changing switch is placed in the middle of the board, while on the right is shown the faradic coil, which is also operated by the street current.

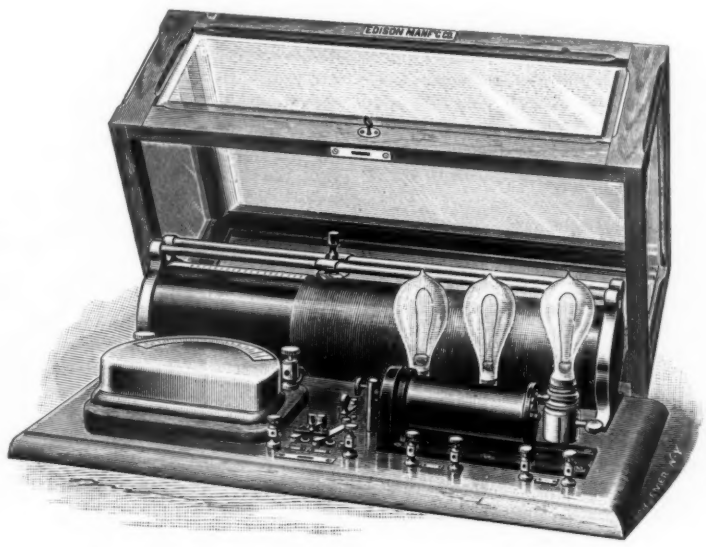
This is of the Du Bois-Raymond type, the secondary being wound upon a separate spool, removable at will. This secondary winding consists of 18 layers of No. 34 wire, having a total length of about ,800 yards. The winding is tapped in six places, so as to divide the coil into six sections, each section consisting of three layers of wire, the whole being connected in series. By this arrangement 3, 6, 9, 12, 15 or 18 layers of secondary winding can be used as required, by moving the switch shown at the end of the coil.

Each section produces an entirely different sensory effect, the current in the first section being very stimulating, whereas the current in the sixth section is of a very pleasing character and produces a sedative effect, the character of the current in the other sections being intermediate between the two extremes. When first put in operation, the secondary coil should always be moved to the extreme right, so as to leave the primary uncovered, the strength of the current being increased by slowly moving it towards the left so as to finally cover the primary coil.

The current in the primary, on the contrary, is at a minimum when it is entirely covered up by the secondary coil, which, in this case, must be short-circuited by a switch provided for that purpose, and it is increased by sliding back the secondary coil to the right.

When the switch at the back of the pole changing switch is turned on, and the vibrator set in motion, the current from the galvanic binding posts is now of a pulsating character, as the primary of the faradic coil is superposed on the straight galvanic current, thereby producing the pulsating current as described by Dr. de Watteville. The strength of these two combined currents is controlled by the rheostat in the ordinary way.

It is thus possible to obtain from this instrument: First, the direct galvanic current of 120 volts; second, the direct galvanic current of 50 volts; third, the primary faradic current capable of six variations, depending on the number of sections of the secondary coil that are short-circuited; fourth, the six secondary faradic currents, all of which manifest distinct characteristics; fifth, the primary faradic current superposed on the 120 volt galvanic current; sixth, the primary faradic current superposed on the 60 volt galvanic current. The instrument is handsomely mounted on a polished quartered oak case and enclosed in a beveled plate-glass case provided with a lock. The apparatus is made by the Edison Manufacturing Company, of New York city.



THE KENNELLY COMBINATION GALVANIC AND FARADIC ADAPTOR.

Schuyler Electric Company.

President Isaac Spear, of the Middletown, Conn., Business Men's Association, has interested himself in the reorganization of the Schuyler Electric Company and is soliciting subscriptions for stock. It is believed that the necessary $30,000 required beyond what is already pledged can be raised if the merchants take hold of the matter.

General Electric News.

It is reported that the management of the General Electric Company has under consideration the sale of a controlling interest in a number of local electric lighting companies.

ELECTRIC RAILWAY NOTES.

The Fox River Electric Street Railway at Green Bay, Wis., went into operation on June 11.

The gripmen on the Broadway cable road, New York, have had their wages increased from $2.25 to $2.40 a day.

Over 500,000 passengers were carried by the Brooklyn Heights, N. Y., company's trolley cars on Sunday, June 17.

A certificate of lease of the Cayuga Lake Electric Railway to the Ithaca, N. Y., Street Railway Company has been filed.

Local capitalists of White Plains, N. Y., are seeking a franchise for a trolley system of cars there, to connect with Mamaroneck.

About a mile of the new electric road between Westerly and Watch Hill, R. I., has been built. The whole line will be completed by July 1.

The Memphis and Raleigh Springs Railroad, an electric line between those towns, 11 miles long, was sold under the hammer recently to satisfy creditors. It was knocked down at $ 01,000.

J. C. Taliaferro, receiver, has sold the Tampa, Fla., Street Railway and Power Company's plant at public auction. It was bought by J. Rush Ritter, of Philadelphia, who holds a large amount of the bonds of the company, for $70,055.

The gross earnings of the West End Street Railway Company, of Boston, for May increased about $30,000. Officials of the company are not much disturbed by the passage of the Meigs bill, as they believe that the inability to command the necessary money to pay heavy damages will make it impracticable to build the line.

A petition has been presented to the village trustees from the Long Island Electric Railway Company for a franchise to build and operate a trolley road in the town of Jamaica, L. I. If permission is secured the road will be put in operation within a year. The matter will be reported by a committee on the 28th instant.

The street railway owners of St. Louis have for three years been negotiating for a consolidation of all the lines. This is now about accomplished, only minor details and some change in legislation standing in the way, which will no doubt be brought about. When the consolidation is effected 290 miles of railway, capitalized at $19,000,000, will be under one general direction.

The New York *Times* published last week a four column article, dated Providence, R. I., stating that Senator Aldrich from Rhode Island is a business partner of J. E. Searles, secretary and treasurer of the sugar trust. Not only are Messrs. Aldrich and Searles partners in an enterprise which involves millions of dollars, but it is said the partnership was formed in such a way as to put Senator Aldrich under especial obligations to the sugar trust magnates. Senator Aldrich is actively engaged in securing a monopoly of street railway systems in Providence, to which Mr. Searles, who is a director, has contributed or he and his associates in the trust contributed, $1,500,000.

A correspondent at Telluride, Col., writes that on June 6 the entire 120 stamps of the San Miguel Consolidated Bear Creek mill and the 40 stamp Gold King mill were dropping simultaneously for the purpose of making a power test, which proved satisfactory. The distance from the mouth of Bear Creek, where the connection was made with the electric power line of the San Miguel Consolidated to the Belmont mill, is 19,000 to 20,000 feet. The distance from the mill to the generating station at Ames is nearly 14 miles. The motor for the Belmont mill is in place, the connection with the machinery made and the mill will be put in steady operation this week.

It was reported in Brooklyn, N. Y., last week that some capitalists, most of whom reside in Philadelphia, have obtained a franchise and have been making the necessary arrangements for the construction of a system of trolley railroad lines to extend over Long Island. Their roads will come in at a terminus of the King's County "L" Road, the Atlantic Avenue Trolley Road, the Thirty-ninth street terminal line and the Flynn syndicate lines. They are to pass through Jamaica, thence south, almost in a straight line, to Far Rockaway. In about three months the lines will be in operation. The following men compose the officers of the company: President, A. R. Hart; vice-president, Charles H. Mullin, of Mount Holley Springs, Pa.; treasurer, Clarence Wolf; secretary, J. C. Von Arx. The financial backers of the project are said to include Benjamin Wolf, Charles M. Cooper, William H. English, William D. May, Henry Loch and Manuel Allmayer. It is to be called the Electric Long Island Railway Company. The road is to run parallel with the Long Island Railroad tracks through Suffolk County to Patchogue and all the towns along the line.

LITERARY.

We have received a programme of the exercises held at the ninety-seventh commencement of Union College, June 24–27, 1894.

Scribner's Magazine, during the Summer months, will contain a group of social studies of typical American Summer resorts, the four selected being Newport, Lenox, Bar Harbor and the North Shore of Massachusetts. The last named is discussed by Robert Grant in the July number, with illustrations by W. T. Smedley. Other authors in the group will be F. Marion Crawford and W. C. Brownell.

The Funk & Wagnalls company, 18 and 20 Astor Place, New York, have published Volume I of "Funk & Wagnalls' Standard Dictionary of the English Language." The work will be issued in two volumes and also in a single volume. It will contain nearly 300,000 words and terms, and its preparation and publication will cost about one million dollars. Judging from Volume I, this dictionary will be the most elaborate and complete ever issued, and will contain hundreds of features of value to the general public. The encomiums from high authorities that have been received by the Funk & Wagnalls company leave no doubt of the scientific and philological correctness of the theories upon which the work has been based. The price of this dictionary in the single volume form is $12.00; two volumes $15.00.

F. B. Vandegrift & Company, custom house brokers and United States tariff experts, of 50 South Fourth street, Philadelphia, Pa., are arranging with commendable enterprise a digest of the new tariff bill, which they announce will be published in 72 hours after the President signs it. This edition is specially compiled for manufacturers and dealers, and gives the list of articles classified under their proper headings, together with the rate of duty, paragraph of the law and decisions of the courts; also the allowance of wastage, showing duty to be returned on manufactured articles exported with benefit of drawback, and many other useful matters in connection with the customs service. This we believe is the first book of the kind ever compiled and will undoubtedly meet with great favor. The price of the book is $1.50.

"Electricity One Hundred Years Ago and To-day." With copious notes and extracts. By Edwin J. Houston, Ph. D. (Princeton). 199 pages, illustrated. Price, $1.00. Sent free on receipt of price by the ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

In tracing the history of electrical science from practically its birth to the present day, the author of this work has, wherever possible, consulted original sources of information, and he was fortunate to have at his disposal for this purpose the excellent library of the Franklin Institute, which contains perhaps the most complete collection of scientific publications of the last century to be found in this country.

The work is not a mere catalogue of subjects and dates, nor is it couched in technical language that only appeals to a few. On the contrary, one

FIG. 1.—THE MANHATTAN ARC LAMP.

of its most admirable features is the agreeable style in which the work is written, its philosophical discussion as to the cause and effect of various discoveries, and its personal references to great names in electrical science. Much information as to electrical phenomena may also be obtained from the book, as the author is not satisfied to merely give the history of a discovery, but also adds a concise and clear explanation of it.

Buffalo Bill, Wire Fences, Electrical Currents and Dews.

Col. William F. Cody, "Buffalo Bill," besides his many other accomplishments, including the proprietorship of the Great Wild West Show, has blossomed out into something of a scientist. Col. Cody has an article in the June *Cosmopolitan* on "Famous Hunting Parties of the Plains," in the course of which he says:

"But I have never seen this strange fact about the dew recorded anywhere. In the old days it was possible to walk anywhere in that country, in the grass or out of it, at any time of the day or night without wetting one's moccasins. There never was dew on any of the great plains between the Missouri River and the Rocky Mountains. You slept out in your blanket at any season of the year, and when you awoke in the morning it was as dry as when you lay down. There has been an absolute change in all this. Heavy dews fall with as much regularity there as elsewhere. I have a theory of my own to account for this phenomenon, and that is that the erection of wire fences, which has unquestionably greatly increased the downfall of rain, has in the same way, by the attraction of electrical currents, brought about the dew."

Preservation of Telegraph Poles.

One of the latest and probably one of the most useful inventions in the electrical field is Mr. Wohl's new process of protecting wooden poles against the attack of moisture in the ground. Quite recently Mr. Wohl, who is a gentleman who has intimately studied this problem, has made known the results of a long series of exhaustive tests and experiments. Mr. Wohl bases his method upon the fact (also observed by him) that rain showers, however severe they may be, do not soak further into the ground than from 25 to 30 centimeters. Relying upon the correctness of his observation, he reasoned that if he could find means to properly protect the trunk of the pole, standing within the 25 to 30 centimeter zone below ground, the difficult problem would be solved satisfactorily. After a great many trials, Mr. Wohl has finally adopted the following method which, he claims, is an absolute preventative against the rotting or decaying of poles. He removes the earth around the foot of the pole and makes a circular excavation, 25 to 30 centimeters deep. In case the pole is decayed, the rotten portion is first removed, and the wood scraped clean. He then applies a wash of hot tar, or any other adhering substance. Around this tarred portion is placed a layer of clay, specially prepared and glazed on its outer and inner surface, constituting two half cylinders whose parts fit into each other, forming a complete sleeve. The space between the inner side of the sleeve and the pole is filled with a dry insulating substance, which in turn is covered with a semi-liquid material,

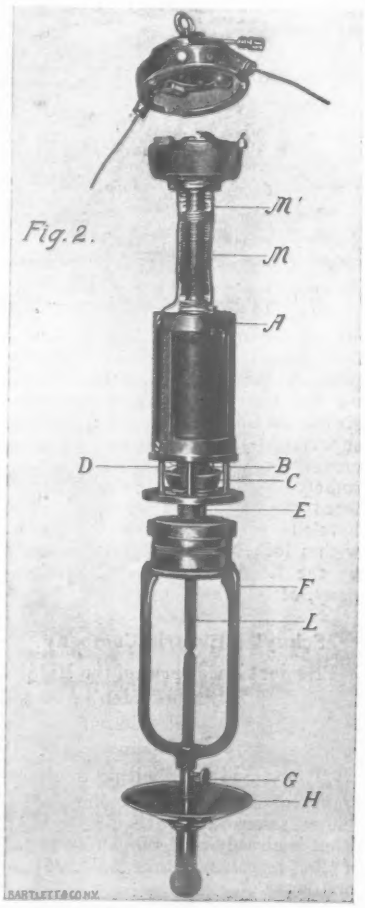


FIG. 2.—MECHANISM OF MANHATTAN ARC LAMP.

impenetrable to water and quickly hardening. Finally the earth is replaced. Mr. Wohl claims that this process not only protects poles against decaying, but also greatly increases their stability in the ground.

The Manhattan Arc Lamp.

The arc lamp illustrated and described herewith has just been placed upon the market by the Manhattan General Construction Company, of New York city. The lamp has many novel features and was designed to present these advantages: Fewness of working parts and decrease in cost of repairs; susceptibility to artistic design; economy in trimming and carbons; an inclosed globe to act as a spark arrester and to prevent insects from collecting in the globe; where desirable a series arc lamp that would burn at a high potential and small current; an arc lamp that would burn one in series on incandescent circuits; a lamp that would generally be more regular in feed and positive in cutting out. The application for the main features of this lamp was made by Mr. William Jandus in 1887, and he has since that time been working on the perfection of the mechanism.

Only one form of construction satisfied all requirements and that was to have the mechanism concentric to the central stem—magnet, armature, clutch mechanism, cut-out device, globe and carbon-holding frame. The main line circuit runs through a switch in the cap. To take down the lamp it is only necessary to give the lamp a quarter turn when it drops out of the cap, leaving the circuit to pass uninterrupted. The wires enter the cap through inclined insulated openings which exclude the weather.

Fig. 1 shows a general view of the Manhattan lamp. Fig. 2 is a view of the skeleton of the lamp, the air tight shell at center being removed to show the feed mechanism. Fig. 3 shows all the parts of the lamp.

In Figs. 2 and 3, A is the magnet, B the armature carrying the clutch pan C and engaging through suitable slots in the armature the clutch rings D, which have radial play within the slotted tube K. In the upward travel of the armature B the flaring pan C engages the clutch rings B against the inserted upper carbon, raising it to form the arc. J is a cast-iron box containing brushes for current to the upper carbons. J^1 is a sectional view of the box and J^2 shows the box with cover removed and carbon inserted showing gravity contact of the brush rings against the carbon surface. E is the negative terminal casting having an embossed cut-out seat P. A cut-out ring N held out of contact with seat P by an insulated spring O is secured to the negative terminal casting E. The negative carbon frame F threads into the lower part of casting E. The slotted tube K passes through the opening in casting E, the brush box J being screw threaded to the end of the slotted tube K and insulated from casting E.

In Fig. 2 the brush box J is concealed from view by the carbon frame F. G is the negative carbon clamp, suitably insulated from a dust pan H, which has yielding contact against the lower opening in air-tight globe. L is the upper carbon holder or sheath, removable with the carbon. M is a resistance path to cut-out ring N. M^1 (part of same resistance coil) is a shunt on the main coil of magnet to regulate the length of arc.

The circuit through the lamp is as follows: The current passes from the positive terminal through the main coil of magnet into the magnet A and slotted tube K to the brushes J and clutch rings D to the upper carbon, to the lower carbon and out through the negative terminal. It is provided with two paths—one through the main coil and carbons, and the other through the resistance M to the spring O and cut-out ring N to the seat P of

the casting E and out through the negative terminal. An insulating washer separates the armature B from the cut-out ring N, the contact between the ring N and seat P being effected by the weight of armature B. The spring O allows the beveled ring N to seat itself adjustably on the embossed seat P, insuring a sliding contact thereon.

The cut-out is called into service only in cases of obstruction to the prompt descent of the upper carbon, which, it is said, is a rare occurrence. In all other cases the cut-out is effected through the carbons themselves after being consumed to the predetermined point.

To shorten the lamp the customary carbon rod has been dispensed with, and a carbon sheath or holder, feeding through the clutch rings with the bare carbon, substituted; and though the diameter of the sheath is appreciably larger than the carbon carried, they both feed through the clutch rings without any variation in voltage. This is due to a cushioned clutch feed, which feature gives a smooth and imperceptible feed without "jumps."

If preferred, the carbon holder or sheath may be dispensed with and the carbon fed direct. It may be thought desirable by some to use an 18 inch carbon, which will cut-out when burned down to the proper point, say, within five inches of the end. This stub may then be used as a lower carbon for another run.

A very important feature of the lamp covered by broad claims is the enclosed globe. The globe is air-tight at all points except at the bottom, which is closed by the yielding pan H. This method of preventing oxidation of carbons by closure is one of the principal features of the lamp, as it makes practical the trimming and cleaning of globes without disturbing any air-tight bearings. The globe is cushioned in its upper portion on soft asbestos gaskets, and there made air-tight. The lower part of the globe has a hand hole large enough to conveniently permit of cleaning and trimming. This hand hole is yieldingly closed by a detachable dust pan.

On the formation of an arc the enclosed air is heated and rarefied, the surplus air escaping through the lower vent. The contained oxygen is soon reduced by combustion with the carbon points to carbon monoxide, and this, with the remaining nitrogen, surrounds the arc and protects the points from further combustion.

These highly rarefied gases, being much lighter than the surrounding comparatively cold air, have a tendency to rise, and finding no outlet at the top, remain in the globe to the exclusion of the surrounding air, which is much colder and heavier, and which can enter only by slow diffusion.

The distance between the brush rings conveying current to the top carbon and the socket holding the lower is only about eight inches. In the Manhattan lamp the small distance between the two carbons being constant, and the resistance remaining constant, there is introduced no variation of voltage in the arc, and copper covered carbons are unnecessary.

This lamp does not require a special grade of carbon, and it is claimed that ordinary carbons burned in this enclosed chamber will last about five times as long, and a better quality of cored carbons about six times as long, as the same carbons burning in the open air.

The lamp illustrated in Fig. 1 is designed to burn one week on half-night service without retrimming or renewal of carbons. A similar lamp is made to burn about four nights on all-night service, or will require trimming but twice a week. These lamps will be sold exclusively by the Manhattan General Construction Company, 50 Broadway, New York, and 753 Monadnock building, Chicago, Ill., or their duly authorized agents.

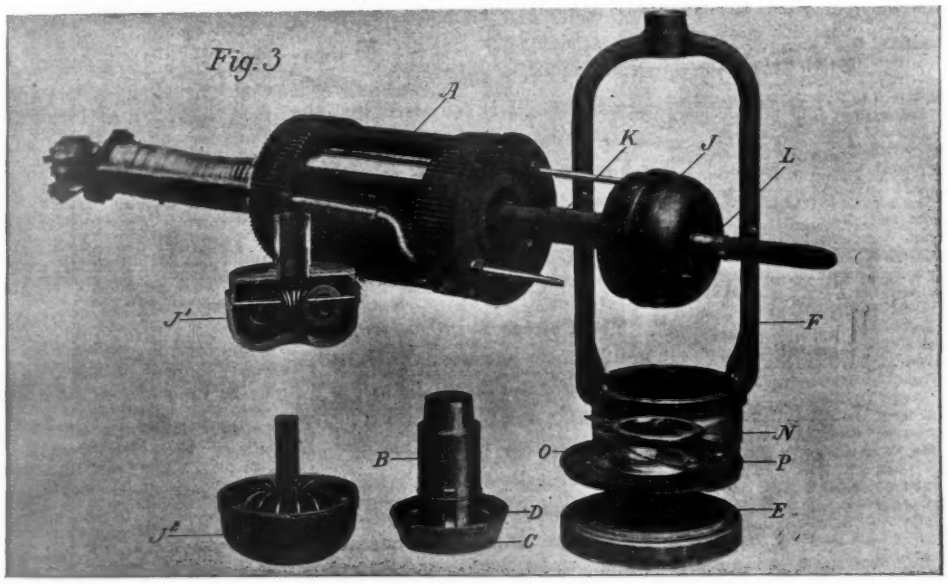


FIG 3.—PARTS OF MANHATTAN ARC LAMP.

The Municipal Company, of St. Louis, Wins Its Boiler Suit.

Charles Miller, trustee for the Rohan Bros. Boiler Company, sued the Municipal Electric Light and Power Company, of St. Louis, for $115,392, a balance alleged to be due for boiler work furnished for the defendant company. The plaintiff showed a contract by which the Rohan Boiler Company was to erect boilers of at least 6,000 horse-power at the rate of $18.50 for each horse-power, but they put in boilers far in excess of this stipulated power. They admitted the receipt of money for the original 6,000 horse-power, but alleged that according to the contract they could put in as much boiler power as space would admit; hence they furnished almost double the specified amount. Judge Klein ruled that they were bound by the contract, and that while it might have been permissible to exceed the 6,000 horse-power slightly, it was unreasonable to attempt to enlarge the contract to such an extent. Plaintiffs were allowed to take a non-suit.

TELEPHONE NEWS AND COMMENT.

Superintendent McDaniel, of the Missouri and Kansas Telephone Company, opened the long-distance line between St. Joseph and Topeka recently with great success.

Norwalk, Ohio, citizens have organized a local telephone company. The incorporators are W. W. Graham, H. B. Hanford, A. C. Green, C. P. Wickham and James G. Gibbs.

A funny telephone suit has been brought in Kansas City, Mo. Mrs. Overstreet is the rival of her husband in the transfer business, and husband and wife are fighting for the possession of a telephone now in the husband's office. Later—wife won.

An ordinance has been passed granting the promoters of the Harrison system in Danville, Ill., a franchise. E. E. Boudinot E. A. Learnard, J. W. White, W. W. Tobey and others were named as parties interested.

The Little Rock, Ark., Telephone Company has been organized with a capital stock of $25,000. The officers are Edward W. Parker, president; George Reichardt, vice-president; Joseph Wolf, secretary, and W. B. Worthen, treasurer. Judge U. M. Rose is also a stockholder and director in the company. A local exchange will be built at once.

The Michigan Harrison Telephone Company has been organized. The company will have its office in the office of the Grand Rapids Electric Company, at Grand Rapids, Mich. R. A. Brett, of Chicago, organized the company and will be its general manager. The stockholders elected the following officers: President, C. R. Sligh; vice-president, S. B. Jenks; secretary, L. P. Cody; treasurer, W. J. Stuart.

The Brooklyn, N. Y., aldermen on June 18, by a vote of 13 to 5, again granted a franchise to the New York and Eastern Telegraph and Telephone Company. This is the third time similar action has been taken, two of the votes being over Mayor Schieren's veto. The Mayor may yet have something to say, as it is understood he is very strongly opposed to the provisions of the franchise.

In France the telephone is used on many railroad main lines. On a portion of the Vincennes railway there is a rather novel system in vogue, by which at a given signal on the telegraph instrument the operator connects the telegraph wires with a telephone for verbal communication. The large Austrian railways use field telephones, which may be connected with the telegraph wires at any point, without interrupting the telegraphic communication.

The Philadelphia councils have agreed to report with favorable recommendation the ordinances authorizing the construction of telephone lines by the Central Telephone Company, the Mutual Automatic Telephone Company and the Drawbaugh Telephone Company. The Central Telephone Company's ordinance provides that the company shall not charge more than $50 per year for each telephone. The Mutual Company's ordinance fixes the price at $50 for private residences and $75 for business places, and requires the company to pay two and one-half per cent of its earnings to the city. The Drawbaugh ordinance fixes the price at $58 for residences and $78 for business houses. All three ordinances require that the wires of the companies shall be placed under ground, with a distributing pole in each block. It is also provided that each company shall place and maintain a telephone in each school section free of charge.

The Philadelphia capitalists who bought the Clamond patents have organized the Clamond Telephone Company and applied for a State charter, which will probably be granted July 7. The syndicate is composed of some of the wealthiest and best known men in the city, the intended incorporators being W. H. Barnes, Beauveau Borie, George Burnham, Jr., T. De Witt Cuyler, Clement A. Griscom, Charles Hartshorne, William P. Henszey, D. S. Newhall, H. H. Houston, C. Hartman Kuhn, E. B. Leisenring, Frederick McOwen and E. Cooper Shapley. J. Andrews Harris, Jr., will, it is understood, be the treasurer of the company. If the expectations of these gentlemen are realized the introduction of this system will revolutionize one branch of the telephone business in the United States. The company is not intended to be a rival to the Bell Telephone Company, the prime object of the incorporators being to secure the introduction of the French system in hotels, apartment houses, country residences, etc., and in railroad service. In fact, it is hoped that the use of the new telephones will enable many of the large railroad companies to do away altogether with their private telegraphic service.

ELECTRICAL REVIEW

Published at 13 Park Row,
P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.
ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.
1546 "CORTLANDT," TELEPHONE CALL.

BOSTON OFFICE:
H. G. TUCKERMAN, Room 29, 620 Atlantic Ave.
CHICAGO OFFICE:
FRED. De LAND, 436 "The Rookery."
WASHINGTON OFFICE:
GEO. C. MAYNARD, 800 H St., N. W.

ADVERTISING DEPARTMENT,
H. T. RICHARDS, Manager.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - - .10

NEW YORK, JUNE 27, 1894.

CONTENTS.

	PAGE
Views, News and Interviews	309
The Stratton Separator	309
The New Fall River Boat "Priscilla"	310
The Thomson Portable Recording Watt-Meter	310
The Telephone Company Wins	310
The Kennelly Combination Galvanic and Faradic Adaptor	311
Schuyler Electric Company	311
General Electric News	311
Electric Railway Notes	311
Literary	312
Buffalo Bill, Wire Fences, Electrical Currents and Dews	312
Preservation of Telegraph Poles	312
The Manhattan Arc Lamp	312
The Municipal Company, of St. Louis, Wins its Bi ber Suit	313
Telephone News and Comment	313
New York Electrical Society	314
Wall Street and the Electrical Stock Market	315
Quick Cable Transmission	315
The Latest News	315
Our Chicago Letter	315
About Those Wiring Joints in Philadelphia	315
Fort Wayne News	315
A Westinghouse Dividend	315
A Re Union Dinner	315
The Postal Telegraph Cable Company's Receptions	315
Mechanical Draft	316
Cost of Chicago's Elevated Road	317
Northwestern Electric Association	317
The Telephone and the Railroad	318
Electric Light Flashes	318
Telephone Men Confer—Where was Wm. A. Hovey?	318
Taussig's Electric Smelting Process	319
How the Congressman Viewed the Electrical Unit Bill	319
The Brown & Sharpe Manufacturing Company's Plain Milling Machine	319
Electrical Patents	320
Advance Information	320
Kindred Interests	x

INDEX OF ADVERTISERS.

COVER PAGES.

	PAGE
Abendroth & Root Mfg. Co.	xvi
American Electrical Works, insulated wire.	i
Ansonia Brass & Copper Co., wire	xvi
Armington & Sims, engines	xvi
Beacon Vacuum Pump and Electrical Co.	i
Bristol Co., The, recording instruments	i
Bunnell & Co., J. H.	i
Campbell Electrical Supply Co., insulating tape	i
Day's Kerite, insulated wire	i
Eastern Electric Cable Co., insulated wire.	xvi
Eddy Electric Mfg. Co., motors	i
Goubert Manufacturing Co., Stratton separators	xvi
Hampson & Co., E. P., engines	xvi
Manhattan Electrical Supply Co.	i
McKenney & Waterbury	i
National India Rubber Co.	i
Okonite Co., insulated wire	i, xiv
Rhode Island Tool Co.	xvi
Stanley Electric Mfg. Co	ii
Stirling Co., boilers	xvi
Underwood Mfg. Co.	i
Weston Engine Co., engines	i

INSIDE PAGES.

American Bell Telephone Co	iv
American Carbon Co., carbons	viii
American Watch Tool Co.	xiv
Ashcroft Mfg. Co., gauges	xiv
Baker & Co., platinum	x
Berlin Iron Bridge Co., iron roofs and buildings	xi
Billings & Spencer Co.	xiv
Bishop Gutta Percha Co.	v
Bolgiano Water Motor Co.	320
Brown & Sharpe Mfg. Co.	xiv
Brush Electric Co.	vi
Bryant Electric Co.	xiv
Buckeye Electric Co., incandescent lamps	viii
Buckeye Engine Co., engines	ix
Butler Hard Rubber Co.	ix
Case Engine Co., The J. T., steam engines	vii
Central Electric Co.	iii
Clark Electric Co., arc lighting	iv
Clonbrock Steam Boiler Works	v
College of Engineering	x
Columbia Carriage and Cycle Co.	320
Connecticut Pipe Mfg. Co.	vii
Consolidated Electric Storage Co.	vi
Correspondence School of Electricity	x
Correspondence School of Technology	320
Correspondence School of Mechanics	x
Diehl & Co	xiii
Dixon, Jos., Crucible Co., belt dressing	iv
Electric Construction and Supply Co	iii
Electrical and Mechanical Engineering and Trading Co.	ix
Electric Storage Battery Co., accumulators.	xiii
Empire China Works, porcelain specialties.	iv
Equitable Life Assurance Society	vi
Falls Rivet & Machine Co., friction clutches	xiii
Faraday Carbon Co., carbons	v
Garvin Machine Co.	iii
General Electric Co.	vii
General Electric Launch Co., electric launches	x
Globe Iron Roofing and Corrugating Co.	x
Gooch, Chas. J., patents	320
Greeley & Co., The E. S.	xi
Harrisburg Foundry & Machine Works, engines	vi
Harrison International Telephone Co.	iv
Hart & Hegeman Mfg. Co.	xiv
Hathaway Office Building	x
Helios Electric Co.	xiv
Hornberger Electric Mfg. Co.	ix
Huebel & Manger	xiv
Hulbert Fence and Wire Co.	iv
Ingersoll, H. R. & Bro	x
Interior Conduit and Insulation Co.	xiv
Johns Mfg. Co., H. W., vulcabeston	ix
La Roche Electrical Works	xiv
Leclanché Battery Co.	xiv
Leffel & Co., James, water wheels	xi
Lehigh Valley Creosoting Co., creosoted lumber	x
Leonard & Co., H. Ward	x
Manning, Maxwell & Moore	xiv
Marshall, Wm., condensers	iv
Moore, Alfred F., wire	ix
Morris, Tasker & Co.	xiii
National Conduit Mfg. Co.	vii
National Pipe Bending Co., feed-water heater	ix
National Telephone Mfg. Co.	iii
New England Engineering Co.	iii
New York Belting and Packing Co., rubber belts	iv
New York Insulated Wire Co., wires and cables	xiii
New York & New England R. R.	x
New York & Ohio Co.	viii
Novelty Electric Co	xiv
Ostrander & Co., W. R., supplies	vi
Oxford Mfg. Co.	x
Palmer Bros., telephones	320
Perkins Electric Switch Mfg. Co.	xiv
Pettingell-Andrews Co.	xi
Phillips Insulated Wire Co.	viii
Phoenix Glass Co.	v
Photo-Engraving Co., engravings	iv
Pope, Read & Rogers	x
Ritchie, E. S. & Sons	x
Robinson & Orr, steel rails	vi
Royce & Marean, electrical supplies	vi
Schieren & Co., Chas. A.	320
Scientific Machinist Co	x
Self-Winding Clock Co	xiv
Shiffler Bridge Co.	320
Splitdorf, C. F.	320
Standard Paint Co.	320
Wallace Electric Co	ix
Western Electric Co., supplies	iv
Western Telephone Construction Co.	iv
Westinghouse Electric & Manufacturing Co.	v
Weston Electrical Instrument Co., measuring instruments	viii
White-Crosby & Co., contracting engineers.	x
White Dental Mfg. Co., acid gravity battery.	vi
Williamsport Wooden Pipe Co.	xiv
Wyckoff Pipe Co., inc.	ix

Read the electric fan announcements in the ELECTRICAL REVIEW and keep cool.

These are days of progress in electrical manufacture. We think no company has done more in the way of improving and modernizing its apparatus than the ably-managed Stanley company, of Pittsfield, Mass. The genius of Stanley and the thorough business methods of General Manager Henry Hine may be credited with the pronounced success of this company, and the ELECTRICAL REVIEW gladly gives this honorable mention where it is clearly due.

Engineer Baker, of the Metropolitan Elevated Railway, Chicago, calculates that the use of electricity will save that company at least $300,000 per year over what the operating expenses would be if the trains were driven by locomotives. To supply anthracite coal for 60 engines would cost $400,000 per year for fuel alone. By using bituminous coal in stationary boilers, it is estimated that the cost for fuel will be less than $200,000, while the saving in salaries of high-priced locomotive engineers and economy in other directions will easily aggregate $100,000 more.

The Chicago *Evening Post*, in an editorial on electrical vehicles in cities, intimates that "the days of the horse as a beast of burden in large cities seem to be numbered," and that electrically operated vehicles will rapidly come into use. It is a long time since experiments were first commenced in connection with them, but it is only recently that they have been carried to a point of success. The difficulty has not been to get a vehicle that could be moved along the streets at any desired rate of speed and in any direction, but in supplying the motive power at a price that would permit successful competition with horseflesh. This difficulty is now said to have been overcome. New types of batteries have been introduced which take up little room and which are inexpensive to keep charged with sufficient power to meet all the necessities of the case. For the new vehicles it is claimed that they can be propelled along the thoroughfares at any rate of speed that may be desired and without making any noise. No difficulty is experienced in making them thread their way among the mass of other vehicles or in keeping them under perfect control. Those already built have broad tires, but it is proposed to introduce pneumatic tires, which will be lighter and more satisfactory.

God certainly should bless the man who first conceived the electric fan.

They now talk of the "deadly transmitter." It is rapidly becoming very dangerous to live. The old wash-tub cannot escape the ghoulish scientists much longer.

Economy seems still to be the order of the day. We know one central station man who says he has bought no supplies for three months and will probably buy none for three months to come.

Mr. S. T. Packard, editor of the Portland *Transcript*, Portland, Me., writes us as follows under date of June 17: "I consider the ELECTRICAL REVIEW one of the most interesting papers on our exchange list."

NEW YORK ELECTRICAL SOCIETY.

One of the principal aims of the New York Electrical Society is not only to keep abreast of the times by giving lectures or papers which embody the latest developments in electrical theories, but to afford its members an opportunity from time to time of seeing the practical side of electrical progress in its most advanced and most approved form. A very successful season was fittingly brought to a close on Tuesday, June 19, by a visit, on the invitation of the Postal Telegraph-Cable Company and the Commercial Cable Company, to the new Postal building, at Murray street and Broadway.

The visitors, to the number of 180, among whom were many ladies, assembled in the large room on the second floor, where at eight o'clock the annual meeting of the society was held. According to the treasurer's report the finances are in a healthy condition, there being $107 in the treasury, and the secretary's report showed a net increase for the season of 40 members, 43 having been elected and three struck off the rolls for non-payment of dues, and a total membership of 350.

The election of officers resulted as follows: President, C. O. Mailloux; vice-presidents, Dr. William J. Morton, Dr. Michael I. Pupin, Luther Stieringer, F. A. Pickernell, W. S. Barstow and C. S. Bradley; treasurer, Henry A. Sinclair; secretary, George H. Guy.

An interesting feature of the meeting was the presentation of a number of electrical books as a testimonial to Mr. Joseph Wetzler, the retiring president, to whose continued and earnest labors the society owes much of its present prosperity. The books, which were presented on behalf of the members of the society by Dr. C. E. Emery, bore the inscription:

NEW YORK ELECTRICAL SOCIETY.
Presented to
JOSEPH WETZLER, Esq.,
By the Members of the Society, as a slight recognition of faithful service on his part, for seven years, in the capacities of Secretary, Vice President and President.
New York, June 19, 1894.

Mr. Wetzler, in briefly thanking the members of the society for this evidence of their appreciation, said, although he was now retiring to the ranks his interest in the work of the society would remain unabated, and he should always hold himself ready to contribute in any way in his power to its advancement and prosperity.

Mr. C. O. Mailloux, the president elect, in congratulating the society on the satisfactory showing on the face of the reports of the treasurer and secretary, took occasion to acknowledge the debt of gratitude which the society owes to Columbia College, for its valuable assistance and support, and proposed that Dr. Seth Low, the president of Columbia College be made an honorary member of the society. The proposal was loudly applauded and was carried unanimously.

The visitors were then taken by the electric elevators to the Hardware Club, at the top of the building, which had been courteously thrown open to them for the evening, after which, escorted by Messrs. Jones, Davis and Usher, of the Postal Company, and Messrs. Platt and Cuttriss, of the Commercial Cable Company, they were conducted to the operating room on the 12th floor, and thence through the building to the basement, where the dynamotors for telegraph circuits, the electric elevator and light and power plants were inspected with great interest.

Wall Street and the Electrical Stock Market.

The general market has been quite weak, owing to the dangerously low point of the United States Treasury gold reserve, in connection with the apparent inability of the government to cope with the situation. This has alarmed Europe and caused a considerable liquidation of our securities. Again have the New York banks stepped into the financial breach. They have agreed to furnish the government from their private gold reserve and metal drawn for export. This has had the effect of restoring confidence in America. It is now reasonably certain that the Tariff bill will be passed by the Senate next week. This is already having its effect upon the Industrial shares, which were the strongest features of the market.

The following dividends were declared during the month.

	Amount	When payable.	Books close.	Open
Ed. Elec. Ill. of N. Y.	q. 1½	Aug. 1	July 18	Aug. 2
Ed. Elec. Ill. of B'k'n.	q. 1½	July 16	June 30	July 17
Ed. Elec. Ill. of Phil'a.	q. 2	June 30	June 23	July 2
Westinghouse pref'd.	q. 1¾	July 2	June 25	July 5
Cent. & S. Amer. Tel.	q. 1¾	July 18	June 25	July 3
Mexican Telegraph.	q. 2½	July 8	June 30	July 9
Thom. Eup. El. weld.	q. 2	June 23	June 23	June 28

These are all regular dividends, declared at the usual time, and speak well for the general prosperity of the electrical industry. In order to realize the full force of this showing the regular dividends on Western Union and American Bell Telephone, which were declared last week, should be taken into consideration.

General Electric was without special feature. There was an absence of all kinds of news and rumors concerning the property. The decline was from 37⅛ to 34½. There was a rally to 35½ at the close. The debenture 5 per cent bonds showed some weakness, selling between 85½ and 86½. A notable feature concerning this issue was the inactivity compared with the previous period of review.

Westinghouse preferred sold at unchanged quotations, the common weakening somewhat owing to the fact that no dividend was declared thereon, as was more than half expected. It was bid 35¾ and held at 36¼.

Bell Telephone was strong around 200. This company's bill giving permission to increase the capital stock from $20,000,000 to $50,000,000 has passed the Massachusetts Legislature and is now in the hands of the Governor. It is confidently expected that it will meet with executive approval. It was not amended imposing restriction as to the disposition of the increased capital, and it is believed that shareholders will receive the advantage of valuable rights.

On the Boston Exchange, Erie Telephone was strong around 48½; New England Telephone somewhat weaker at 62; Fort Wayne Electric dropped from 11½ last week to 1½ to 1¾ this week. It is quite evident that buying for control has either been completed or given up. Electric Traction of Philadelphia was bid 67 and held at 68 on the par of 50. The rights were offered at 27⅜.

New York, June 23. BAIN.

Quick Cable Transmission.

Mr. Beard, the secretary of the Central and South American Telegraph Company, informs the ELECTRICAL REVIEW that the message giving the result of the "Oaks" left London by Western Union cables at 3.36 P. M. (Greenwich time), reached New York 3.39 P. M., reached Galveston 3.40 P. M., Lima, Peru, and Valparaiso, Chili, 3.41 P. M., Buenos Ayres, Argentina, 3.42 P. M.

THE LATEST NEWS.

The Philadelphia Edison Company has declared a dividend of two per cent payable June 30.

The St. Louis Subway Commission has agreed upon plans for placing all wires in the city underground.

Purchasing Agent Barton of the General Electric Company will resign at an early date as he does not want to go to Schenectady.

The Chattanooga, Tenn., Cotton Oil Company is in the market for a 50 light electric plant. Address E. G. Richmond for particulars.

John I. Beggs has superseded Geo. B. Kerper as general manager of the Cincinnati Edison Electric Company. Mr. Kerper retains the vice-presidency of the Company.

The Edison Electric Illuminating, of New York, has declared a quarterly dividend of one and one-half per cent, payable August 1. Books close July 18 and reopen August 2.

Lizzie Halliday, a murderess, and the first woman to be condemned to the electric chair, will be electrocuted at the Auburn, N. Y., prison during the week beginning August 6.

L. A. Crosset, of Abington, Mass., has been elected president of the Rockland and Abington Electric Light and Power Company in place of Major E. P. Reed, deceased.

It is reported that the General Electric Company has secured the contract to equip the Metropolitan Elevated Road, at Chicago, with an electric system like the Intramural at the World's Fair.

Gen. B. F. Peach, treasurer of the General Electric Company, has resigned because he doesn't care to go to Schenectady, N. Y. He is a candidate for the United States Sub-Treasurership, at Boston.

Senator Peffer's bill for the establishment of an electrical experiment station, and appropriating $100,000 thereto, has been reported favorably from the Committee on Agriculture in the United States Senate.

The Fulton Municipal Gaslight Company, of Brooklyn, N. Y., which is practically owned by the Standard Oil Company, announces that it will reduce the price of gas, for which it is at present charging $1 per 1,000 cubic feet to 90 cents; that on September 1 another reduction to 75 cents per 1,000 will be made, and that again, on January 1, 1895, another reduction to 50 cents per 1,000 will be made, providing the other companies do not in the meantime go into liquidation.

The Southwestern Electric Light and Water Power Company, which operates an extensive light and power plant at Grand Falls, four miles from Joplin, Mo., and which supplies electric lights to Joplin, will erect a big light and power station within the city limits. The plant at Grand Falls will be in part dismantled. The new station will include shops for the repair and rebuilding of electrical machinery and will furnish power to operate an electric line, which is to be built from Joplin to Galena, Kan.

OUR CHICAGO LETTER.

The Manhattan Brass Company has secured damages against the Great Western Manufacturing Company for the sum of $710.

General Manager Hibbard of the Chicago Telephone company does not think the toll system of rates arranged for in New York will be inaugurated in Chicago soon.

The Chicago Edison Company has been sued by Mr. Earl A. Bixby, of Hammond, Wis., who asks for the small sum of $40,000 damages for being injured by a flying manhole cover, the outcome of a conduit explosion.

The Knapp Electrical Works has secured judgment against the Detroit Dynamo Company for $925 with special execution, and the Missouri Lamp and Manufacturing Company has secured judgment against the Union Electric Works for $313.

The Board of Fire Underwriters propose to establish a bureau for the improvement of the electrical fire hazard throughout the northwest. It is proposed that this bureau collect and disseminate data regarding fires resulting from electricity, educate underwriters on electrical hazards, labor to secure uniform ordinances for electric wiring and installations and maintain a laboratory in which tests will be made of various electrical appliances offered. F. DE L.

Chicago, June 23.

About Those Wiring Joints in Philadelphia.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have read your article in issue of 20th instant, relative to defective wiring in a mill located in Philadelphia. As I have no jurisdiction over the city named must plead *not guilty*, and refer the matter to the electrical inspector of that city, who, I presume, would be pleased to have an introduction to such a worthy member of the electrical fraternity as the person who installed this work must surely be.

Yours truly,

ALFRED E. BRADDELL,
Inspector Underwriters' Association of the Middle Department.

Philadelphia, June 22, 1894.

FORT WAYNE NEWS.

The restraining order granted by Judge Dawson, of Fort Wayne, Ind., which prevented the stockholders of the Fort Wayne Electric Company from holding their annual meeting on June 9, was made returnable on June 18. At that time the persons on whom the order was served were expected to show cause why it should not be made permanent. When the matter came up on June 18, the hearing was postponed for two weeks at the request of the attorneys for the General Electric Company.

A Westinghouse Dividend.

The Westinghouse Electric and Manufacturing Company has declared its regular quarterly preferred stock dividend of one and three-quarter per cent, payable July 2. Transfer books close June 25 and reopen July 3.

A REUNION DINNER.

MEMBERS OF THE NEW YORK ELECTRIC CLUB MEET AT THE HOTEL IMPERIAL.

On Thursday evening, June 21, 30 members of the old New York Electric Club met at a reunion dinner in the beautiful Moorish apartments at the Hotel Imperial. The object of the dinner was to renew club friendships and to discuss a proposition to revive the club organization in a modified form.

Mr. Stafford, one of the proprietors of the Hotel Imperial, made a very generous offer of the use of the rooms in which the dinner was held, should the club decide to reorganize. The following committee was appointed to consider plans of re-organization: E. E. Bartlett, chairman, H. L. Webb, C. D. Shain, T. C. Martin, Major Everts, P. H. Alexander, G. F. Porter. The committee was authorized to increase its membership, if necessary, and to call a meeting of the club members to receive its report.

H. Ward Leonard acted as chairman of the evening, and T. C. Martin performed the duties of toast-master in his usual felicitous way. Those present were: E. F. Peck, F. W. Royce, E. E. Bartlett, C. O. Baker, Jr., T. C. Martin, H. Ward Leonard, C. E. Carpenter, H. L. Webb, Geo. F. Porter, H. J. Smith, E. G. Bernard, B. E. Greene, L. H. Orr, S. Rosenstamm, E. V. Cook, Major Everts, F. R. Chinnock, A. H. Reece, C. D. Shain, P. H. Alexander, C. E. Chapin, W. J. Johnston, Geo. Cutter, Stephen L. Coles, J. Draper Bishop, E. T. Lozier, E. F. Powers, T. C. Perkins, R. B. Ayres and J. W. Godfrey.

The toasts were quite witty in conception and some of the responses equally so. Speech-making was indulged in until a late hour in spite of the extremely uncomfortable hot weather.

The Postal Telegraph-Cable Company's Receptions.

Last week and part of this are gala days for the Postal Telegraph-Cable Company, whose handsome new building at 253 Broadway, New York, has been visited by thousands. The following is a memorandum of the invitations issued:

Monday, June 18—Telegraph and telephone companies; electrical manufacturing companies; New York daily papers; press associations; electrical papers and Magnetic Club.

Tuesday, June 19 — New York Electrical Society.

Thursday, June 21—Resident members of the American Institute of Electrical Engineers; American Street Railway Association; Association Edison Illuminating Companies; National Electric Light Association.

Friday, June 22—Department of Electricity, Brooklyn Institute; Department Electrical Engineering, Columbia College,

Tuesday, June 26 — Commercial Travelers' Club.

Wednesday, June 27, will be reserved for the personal friends of the employés of the Postal and Commercial Cable Company and the tenants of the building.

Mr. James J. Wood, of the Fort Wayne Electric Corporation, was in New York last week.

MECHANICAL DRAFT.

READ BEFORE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, MONTREAL, JUNE, 1894, BY WILLIAM R. RONEY.

The importance of good draft, natural or artificial, for supplying sufficient oxygen for the economical combustion of fuel, has long been recognized by intelligent engineers. The gain, both in efficiency and capacity, obtained by the rapid and energetic combustion of the various kinds of coal, and the resulting high furnace temperatures, is well established. Its importance has, however, been generally conceded only within a few years. The wonderful stimulus which the development of electrical industries has given to the building of compound engines has necessitated higher boiler pressures, and this in turn has greatly increased the use of boilers of the water-tube type. While high initial temperature in the furnace is essential to the best economy with all types of boilers, it is especially so with water-tube boilers, with their large amount of heat absorbing surface in close contact with the products of combustion; as otherwise, the temperature of the gases will be lowered below the point of ignition and will pass to the chimney only partially consumed. To obtain this high furnace temperature requires draft sufficiently strong to deliver an abundant supply of oxygen to the furnace.

There are two well-known means used for accomplishing this result, viz.: natural draft, produced by a column of heated gases in a chimney of suitable proportions; and forced draft, obtained by mechanically creating a pressure under the grates with a blower or fan.

A third means, less widely known, is mechanical exhaust or induced draft, produced by a suction fan so arranged as to draw the waste gases from the furnace and discharge them into a short stack sufficiently high to clear surrounding buildings.

Although the idea is by no means a new one, yet it is only within a few years that mechanically induced draft has been much used or installed on a large scale. Previously it had been used, with a few exceptions, for the purpose of improving poor draft by helping out an insufficient or an overloaded chimney. On account of the height of the stacks being necessarily limited, artificial or forced draft has been used on ocean steamers for many years. Here the usual method of producing artificial draft is by rapid-running pressure blowers discharging under the grates, or into the fire room, which is made practically air-tight, and maintaining an air pressure in the room of two and a half to three ounces. This method of producing artificial draft is at an expense for power to drive the high-speed blowers, which would not be considered for a moment except on shipboard, where the limited space, as a rule, prohibits the use of large, slow-running fans and where economy is not the most important consideration. Experiments in the use of mechanically induced draft are now being made on some of the Atlantic liners. The steamer "City of Berlin," of the American line, was fitted up last year with large steel exhaust fans, driven by direct-connected engines, and having a capacity in cubic feet of air per minute sufficient to produce a draft equal to 3.5 inches of water. Connections were made to the smoke flues, so that the gases were drawn from the furnaces through a by-pass and discharged into the steel smoke-stacks. The results obtained are not yet made public, as they are still being tested experimentally.

The largest and most successful applications of mechanically induced draft have been made in connection with feed-water heaters designed to utilize the waste heat of the flue gases, and known as fuel economizers. This form of feed-water heaters has been manufactured in England for over 50 years, and in this country for three or four years. They have, however, been imported for many years, as their value as a fuel saving device is well established. Their successful operation is, however, so dependent upon good draft, that no well-informed engineer would think of installing an economizer without making provision for much better draft than the boilers would require without it.

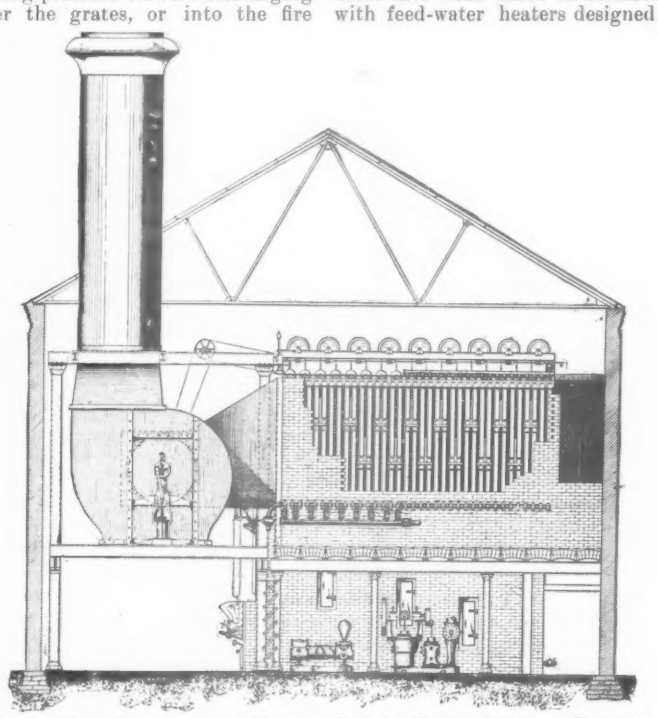


FIG. 1.—CROSS SECTION OF A TYPICAL BOILER HOUSE, SHOWING BOILERS, STOKERS, ECONOMIZER, MECHANICAL DRAFT, FEED PUMP AND CONDENSER.

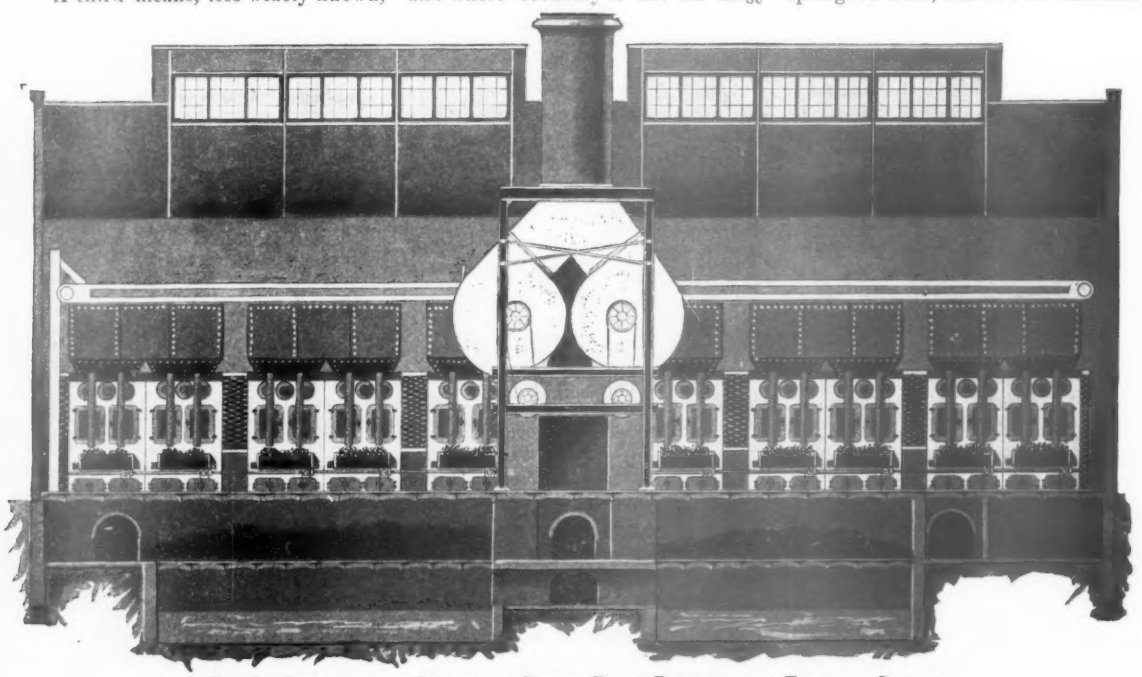


FIG. 2.—LONGITUDINAL SECTION OF BOILER ROOM, PHILADELPHIA TRACTION COMPANY.

On account of the reducing effect on the draft caused by lowering the temperature of the gases and retarding their flow by the mechanical interference of the pipes, it cannot be considered good engineering to attach an economizer to a chimney less than 200 feet in height. In fact, the best working economizers in connection with chimneys are those where the chimney is considerably over 200 feet high.

The objections to be urged against high chimneys, as compared with mechanical exhaust draft when used with economizers, are: First, excessive cost, both on account of the height required and on account of foundations, which must of necessity be very substantial, and which may involve expensive piling and filling. Second, the space required for foundations, which may be very valuable, especially in large cities, or may be required for other purposes and which can with difficulty be spared. A chimney 250 feet high will require foundations not less than 30 feet square, and in some cases much more. Third, a certain minimum temperature of flue gases is required to produce an effective draft and to operate the boilers economically, and this fact limits the amount of economizer heating surface which can be used, and consequently the fuel saving obtained by use of the economizer. The same fact operates unfavorably at small capacities, which are often unavoidable, when the chimney must be built large enough for future increase of the boiler plant. Fourth, a chimney once built limits the maximum capacity of the boiler plant, and also is liable to be affected by atmospheric changes which may seriously impair its efficiency.

These objections to the tall chimneys, which are so essential to the use of economizers, do not hold with mechanical draft.

The first cost of a properly designed mechanical draft plant is very much less than that of a suitable chimney of equal capacity, often averaging 75 to 80 per cent less, according to the size of chimney and character of foundations required. The fans and short stack require very little foundations, even less than that of an ordinary boiler setting. The space usually required for extensive chimney foundations can be utilized for economizers, and by elevating the economizers and fans upon beams and columns, the space underneath them can be used for pumps, condensers, etc., as indicated on Fig. 1, showing "cross-section of a typical boiler house." The space thus saved is often of great value, especially where land is expensive.

Natural draft requires that the gases in the chimney be above a certain minimum temperature in order to secure a proper supply of oxygen in the furnace and a good combustion of the fuel, whereas with mechanical exhaust draft the amount of draft obtainable is entirely independent of the temperature of the flue gases, and when used in combination with a properly proportioned economizer, it is possible to lower their temperature to a point where the draft of even a very tall chimney would be practically destroyed.

Mechanical draft possesses great advantages over natural draft in its flexibility and adaptability to both large and small capacities, and in its ability to meet sudden and excessive demands for steam, either by an extra turn of the throttle valve, or by an automatic regulator controlling the steam supply to the fan engine according to the boiler pressure. It is unaffected by atmospheric changes, furnishing the desired amount of draft irrespective of conditions of wind or weather. Operating independently of the amount of heat in the stack, it is possible to obtain a higher temperature of feed water in the economizer, and a lower temperature of escaping gases than could possibly be obtained with a chimney, and at the same time provide sufficient draft to maintain rapid and economical combustion of

the fuel. There are undoubtedly many boiler plants equipped with economizers and chimneys, where the draft is so greatly reduced by the economizer, that it is an open question whether the saving in fuel by thus heating the feed water is not more than balanced by the loss due to imperfect combustion in the furnace; and whether it would not result in a greater saving in coal to cut out the economizer and get better combustion, and a higher initial temperature due to better draft. Unquestionably the "black eye," which fuel economizers have sometimes received, has been often due to bad engineering and to placing them where the chimney draft was none too good all ready; the result being that they not only failed to show the economy that the purchaser expected, but so impeded the draft that the efficiency and capacity of the boilers were greatly impaired. It was quite natural, under such circumstances, that the economizer should be neglected and allowed to foul up by the accumulation of sediment within the pipes, and of soot without, until it became a source of loss instead of economy. A chapter on the use and abuse of fuel economizers could easily be written, but—"that is another story."

A mechanical draft plant properly designed, with duplicate fans and engines of suitable construction, so arranged that one is always in relay, can be made so reliable that the boilers cannot be shut down by any ordinary accident. With the fans properly designed and proportioned to the work, the power required to operate them is so small as to practically have no effect on the economy obtained. The mistaken idea that prevails somewhat, even among intelligent engineers, regarding the amount of power required for mechanical exhaust draft, is probably caused by the well-known large amount of power required to drive the high-speed pressure blowers and fans used for forced draft. Mechanical draft handles a large amount of heated gases with slow speed exhaust fans at a low pressure, and with a small expenditure of power. To illustrate, the writer recently designed a mechanical draft and economizer plant for 6,000 horse-power of water tube boilers, providing duplicate large slow-running fans of special design, each driven by an independent engine, and each having a capacity, estimated in pounds of coal burned per hour, sufficient to develop 25 per cent in excess of rating, or 7,500 horse-power. The power required to drive one fan to do this work was six tenths of one per cent of the boiler horse-power developed. Or, estimated in coal per horse-power per hour, and at $3.00 per ton, the fuel cost of operating the plant one year was two per cent of the estimated cost of the chimney originally planned for the plant. In other words, it would not pay to build the chimney so long as money was worth more than two per cent per annum.

An illustration of a typical boiler house, showing boilers, stokers, economizer, mechanical draft, feed pumps and condenser, as shown in Fig. 1, will perhaps be of interest. In this illustration the economizer is elevated upon columns and beams to provide for utilizing the space under the economizer for feed pumps, condenser, etc. The exhaust fans, of which there are two placed side by side, are equipped with direct-connected engines; only one engine is shown in the illustration, the other being on the farther side. These fans and engines are of special design, with protected bearings, self-oiling and water-jacketed, to withstand the heat when the economizer is cut out for cleaning or repairs, and the hot gases pass directly to the fans. They are so proportioned to their work as to handle a maximum amount of gases with a minimum expenditure of power.

The arrangement of the economizer pipes and blow-off connections are worth noticing, in that they provide a means of blowing out the sediment which may accumulate in the pipes, and at the same time a complete circulation is maintained in the economizer. Many extensive plants are now in operation, or in process of construction in various parts of the country, equipped with economizers and mechanical draft similarly arranged.

Figs. 2, 3, 4 show longitudinal section, cross-section and plan of probably the largest plant of the kind yet built; viz., that of the Philadelphia Traction Company, Philadelphia, Pa. Two large power houses are in process of erection and partly in operation for this company—one of 7,500 horse-power and one of 6,000 horse-power. The illustrations show the arrangement in the Thirteenth and Mt. Vernon street power house, where there are 20 Babcock & Wilcox boilers of 375 horse-power each, arranged in two parallel rows of 10 boilers on opposite sides of the boiler room. The other station of 6,000 horse-power is arranged similarly, except as to the number of boilers. The gases from each row of boilers are conveyed by flues at the back to the center of the boiler house, as shown on plan view, Fig. 4, drawn through the economizers and discharged into stacks by four large slow-running exhaust fans of special design. These fans are arranged in pairs, and are of such a capacity that two of them will handle the gases for the entire plant, thus leaving two in reserve. The fans are driven by duplicate engines and counter-shafts, so arranged that either engine will drive any one or more fans, as desired. The stacks extend but a few feet above the roof and are lined with brick to preserve them from the corroding action of the gases. The feed water is pumped through exhaust-steam heaters to the economizers and thence to the boilers. At the Thirty-third and Market street station of the same company, the fans are driven by engines belted directly, one small engine to each fan. The economizers, as shown on plan view, Fig. 4, occupy the space originally planned for two tall chimneys, one for each side of the boiler house. These chimneys were to have been 200 feet high with a flue 11 feet in diameter. Two of the fans are capable of producing a draft equal to that of the two brick chimneys originally planned. The power required to drive one of these fans, as the plant is now being operated, is exceedingly small, being less than 10 horse-power for each 2,000 horse-power produced, or less than one-half of one per cent of the power developed by the boilers.

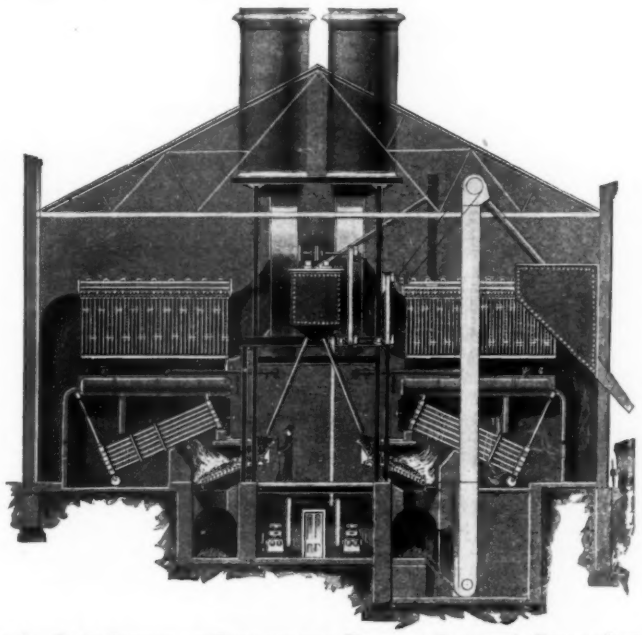


FIG. 3.—CROSS-SECTION OF PHILADELPHIA TRACTION COMPANY'S BOILER ROOM.

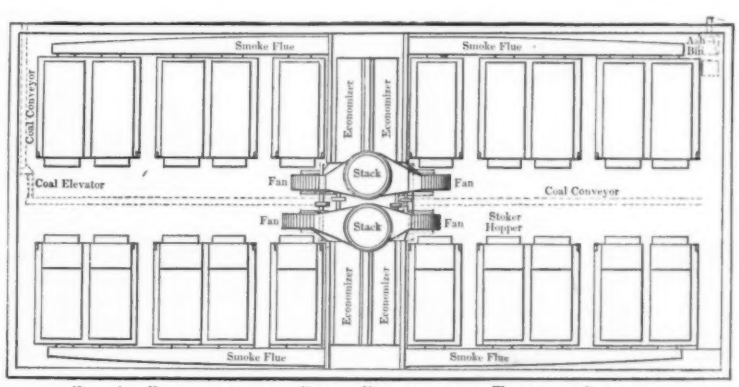


FIG. 4.—PLAN OF BOILER ROOM, PHILADELPHIA TRACTION COMPANY.

TABLE A.

TESTS OF ECONOMIZER AND MECHANICAL DRAFT PLANTS, SHOWING INITIAL AND FINAL TEMPERATURES OF FLUE GASES AND FEED WATER IN DEGREES FAHRENHEIT.

Plants tested.	Gases entering economizer.	Gases leaving economizer.	Water entering economizer.	Water leaving economizer.	Gain in temperature of water.	Fuel saving, per cent.
1	610	340	110	287	177	16.7
2	505	212	84	276	192	17.1
3	550	205	185	305	120	11.7
4	522	320	155	300	145	13.8
5	505	320	190	300	110	10.7
6	465	250	180	295	115	11.2
7	490	290	165	280	115	11.0
8	495	190	155	320	165	15.5
9	595	299	130	311	181	16.8

The data in Table A will be of interest, as showing in tabulated form the results obtained by economizers and mechanical draft in a number of plants in regular service. In every case the feed water was partially heated by exhaust-steam heaters, or in hot wells by condensed steam from various sources.

Cost of Chicago's Elevated Road.

The West Side Construction Company has prepared an interesting report regarding the cost and work of constructing the Metropolitan Elevated Company. The structure is entirely erected from Jefferson street to West Forty-eighth street, all the land for the right of way being purchased outright. The foundations for the new bridge across Van Buren street are approaching completion and before the Summer ends the line will be constructed east to Franklin street. Before August 100 passenger cars will be delivered, and by September the line may be in operation. Regarding the adoption of electricity for motive power the report says: The extra expenditure required to complete the electric outfit is estimated by electric engineering experts to be about $400,000 greater than it would be for locomotive engines, but the saving in operating expenses these experts estimate will amount to about $250,000 per annum on the entire road. The principal saving will be in the difference between the cost of hard and soft coal. The company has already received from the M. W. S. E. R. T. Co. 65,427 full paid shares of the railroad company's capital stock. Of these shares 25,000 will be delivered to bond subscribers, when the final call on the $10,000,000 bond subscription (due June 15) is paid, which will leave 40,427 shares in the treasury. Upon the completion of the 10¼ miles of road this company will be the owner of 75,000 shares of said stock, of par value of $7,500,000, and the surplus real estate before stated.

Northwestern Electric Association.

Secretary Thom, of the Northwestern Electric Association, is gathering his forces for a splendid meeting at St. Paul, on July 18, 19 and 20. Delegations from Washington, New York and other eastern points will meet in Chicago on July 17 and leave at 6.30 P. M., by special sleeper attached to the Northwestern Limited of the Chicago and Northwestern Railway, arriving in St. Paul at 7.50 the next morning. This train will stop at Madison, Janesville, Eau Claire and other points to pick up delegates.

THE TELEPHONE AND THE RAILROAD.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, DETROIT, JUNE 14, 1894, BY CHARLES SELDEN.

Many years ago when Inventor Morse was striving to induce capital to invest in the then new method for the transmission of intelligence, the fear from danger from electric sources, even so minute as those he employed, was of such magnitude that it was with great difficulty that Mr. Morse succeeded in having persons allow him to place his wires in proximity to their property. The unknown agency employed the then mysterious results and effects therefrom, and the well-known and terrible effects from discharges of atmospheric electricity combined to make the subject one to approach with fear and trembling on the part of the conservative and thinking citizen.

That this was of considerable moment as a matter of record, the minutes of the directory of the Baltimore and Ohio Railroad, upon which and along which the first commercial line was constructed, show a provision that Mr. Morse and his associates should bind themselves to remove his construction should it in any way prove dangerous to the property of the railroad company.

While we are disposed at this late day to smile at such a provision, to me it shows but very clearly the care with which the men in charge of the property at that day moved; they were about entering upon an arrangement for the handling of an agency about which Mr. Morse knew comparatively little and they knew less, and so like careful business men that they were, they inserted a clause protecting their company from an unseen but feared danger. I cite this now because, while it bears apparently no relation to the title of this paper, it will be seen that it was the inception of the use of the telegraph or means of communicating intelligence rapidly alongside and in connection with the railroad and its traffic.

Later on when time had demonstrated not only the harmlessness of the new art, but its wondrous help, it began to be used for the purpose of quick communication on matters bearing upon the interests of the railroad company, for the quoting of rates, for the issuance of instructions to agents, and otherwise. A few years later we find that it had become much stronger than ever dreamed of and we find a railroad absolutely directing the movement of its trains by means of this new art, so that instead of the great delays incident to an arbitrary and unchangeable schedule, we find that schedule for the time being superseded or changed, as was deemed best, by means of the telegraph, with an enormous saving of time and an enormous saving of money. Gradually, one by one, railroad people, attracted by the success which had attended its use in this connection, first examined and then adopted the use of this art for the movement of their traffic, and through long life of actual experience at great cost, they discovered the weakness, not in the art, but in its use and at once by rule began to throw around its use such restriction as to make it more strong and more safe, until to-day we find the telegraph in its perfected state. So far as its connection with railroads is concerned, surrounded and intrenched with a bulwark of rules and regulations, it now stands not as a secondary arm of the service, but I think without prejudice, as the first necessity in the movement of a large traffic successfully and economically upon any line of railroad having any extent.

In the old days the Morse register was used and the writer entered the service as an operator using that device. At this day I find before me men in charge of the telegraph departments who never in practice knew what a telegraph register was.

But I wish to impress upon your minds the importance of the register at the time it was used and to show you how prejudiced people become in the use of devices and how hard it is to draw them from an idea that the device has created long after the device itself has ceased to exist as a part of the operation. Railroad men were especially impressed with the register in the early days because it gave a "record." Whenever a question arose as to whether a word had been transmitted this way or that way, the register told the straight story and no question of veracity ever arose between men and the report tape. By and by, as time progressed, it was discovered that the human ear could discern, distinguish and read the symbols and that the hand could indite the messages without any reference to the tape and the era of "receiving by sound" was upon us, and that era has been with us for many a year. If, however, you should ask a railroad officer, or, for that matter, a business man, whether, in his opinion, he could depend upon the telephone instead of the telegraph he will promptly answer no. And when you ask him why, he will say because you have no record. You see he still has in mind that the Morse telegraph furnishes a record of the operation performed by it and he is still clinging to the idea that was handed down to him by those who have crossed the river and who are here no more, but as a matter of fact there is telegraphically no record in the Morse system. It is true a man writes a telegram and files it; that is a record of what he had to say therein, the intelligence conveyed thereby is transmitted by the Morse system and there is delivered at the point of destination a written communication conveying the same intelligence, and that is a record. But, I repeat, not a telegraphic one. There is no record between what transpires at the hands of the sending operator and the ear of the receiving operator. You all have, doubtless, a number of times in your experience been confronted with a serious error causing some one loss, or perchance the more fearful one of human life, wherein two excellent, reliable, first-class telegraph operators were concerned, each one a man of undoubted probity and honor. The one will swear (and in his opinion truthfully) that he sent a word thus and so, while the other will swear (just as truthfully and honestly) that he received it another way and that it must have been so transmitted. Which of these men is right? Where is the record to prove? In the old Morse day the tape would have settled the question; in this day there is nothing to settle it, therefore, this need of a record telegraphically is simply an idea and a delusion.

(To be concluded.)

An official of one of the strongest lines running out of Jersey City says the trolley systems running out of Jersey City are playing havoc with local passenger earnings of all the great railroads. When the trolleys and cables are extended in New York city as is planned, it is predicted that Manhattan elevated railway earnings are bound to suffer greatly.

ELECTRIC LIGHT FLASHES.

Tunkhannock, N. Y., will have an electric light plant.

The Paxton, Ill., electric light plant is using wood for fuel.

It is contemplated to have racing by electric light at Brighton Beach, N. Y.

The electric light plant at Sherman, Texas, has had to shut down for want of coal.

The Clarksville, Ky., electric light plant has been shut down and the apparatus is for sale.

Games and bicycle racing will be held at Manhattan Field, New York city, by electric light.

The electric light plant at Alma, Wis., which was destroyed by fire two months ago, has been rebuilt and is again in operation.

A new 1,300 light Thomson-Houston alternating dynamo has been received by the Newport, R. I., Illuminating Company and will be at once put in position.

The Edison Electric Illuminating Company of Brooklyn, N. Y., has declared a quarterly dividend of 1½ per cent, payable July 16. Books close June 30, reopen July 17.

ELECTRIC MAN—So you want four incandescents in the parlor?

Mr. ONEDAUGHTER—Yes; and please remove those little thumb-snaps so they can't be turned off.—*Boston Courier.*

The injunction granted the Edison Electric Light Company against the Columbia Electric Light Company, of Chicago, to restrain the use of incandescent lamps, etc., alleged to contain infringements on the Edison patents, has been vacated.

The Dunkirk & Fredonia, N. Y., Street Railroad Company has submitted a proposition to the village trustees offering to purchase the municipal electric light plant at its appraised value and furnish lights for the village at $25 each per year.

The Helena, Mont., Electric Light and Power Company's plant has been sold by Receiver S. S. Faulkner. The Helena Gas Company became the purchasers. The Helena Gas Company will rebuild their entire plant and light the city with gas and electricity.

The suit of the Thomson-Houston Electric Company against the Western Electric Company for alleged infringement of the former company's patent for regulating the currents of dynamos has been finished in Judge Grosscup's court and taken under advisement.

It is well known to all citizens of Lewiston that the fine electric light plant of the city has been greatly damaged by the incompetent men who have been in charge of it. Now the damage has been done, an effort is being made to lay the blame onto a former administration.—*Lewiston, Me., Sun.*

The suit of the Edison Electric Light Company against the city of Philadelphia to restrain the use of incandescent lamps at the City Hall, alleged to contain infringements on the Edison patents, has been amended in the United States Circuit Court so as to include as defendants the members *ex-officio* for the erection of the public buildings.

At Chicago, in the United States Circuit Court, the Star Electric Light Company, the Empire Electric Light Company, the Chicago Incandescent Light Company, and the Coöperative Electric Light Company, all Chicago firms, have been made defendants in suits brought by the Edison Electric Light Company claiming infringement of the Edison lamp patent.

The property of the Marble City Electric Company of Rutland, Vt., has been attached for the sum of $5,000 in a suit brought by the Rutland Electric Light Company. In speaking of the matter M. J. Francisco, president of the latter company, said: "The law requires that all stock companies should file in the city clerk's office on April 15 of every year a list of all stockholders and shares held by each, the amount paid on each share and the capital paid in. If this is not done the corporation neglecting or refusing to file these statements forfeits to the city $5,000, to be received by the first person making the complaint and to be paid by them into the city treasury." The Marble City company is alleged to have neglected to comply with the law in this respect.

Telephone Men Confer—Where was Wm. A. Hovey?

[Boston Herald.]

The conference was held in the telephone companies' building on Milk street, but the utmost mystery concerning its nature prevailed. When the reporters arrived there they were informed that no such conference was being held. A colored gentleman, however, was caught in the act of bearing a large pitcher of lemonade, and when queried, said he was "taking it in to the presidents." Shortly after, Mr. J. Otis Wardwell and ex-Representative Powers followed in the wake of the lemonade, remaining in the conference room a few minutes.

Presently a gentleman in a seersucker coat, who said he didn't wish his name used, appeared in the corridor and entered into a brisk conversation with the reporters, which lasted nearly two hours. The substance of his utterance follows:

"Our news is given out through Mr. William A. Hovey. In his absence I have been sent out to inform you that there is nothing for the press. When we are ready, Mr. Hovey will inform all the papers at the same time. Meetings held by the telephone officials are purely of a business nature with which you have no concern."

A message of inquiry was sent to President Hudson of the American Bell Telephone Company, a member of the conference. He replied:

"There is nothing to give out to the public."

Taussig's Electric Smelting Process.

Among the recent German inventions in metallurgy, one of the most interesting, by reason of its simplicity and its probable value in practical application, is a process invented by Mr. Edward Taussig, of Bahrenfeld, for the smelting and casting of metals by electrical heat, under the influence of rarefied air. The operation consists in fusing ores or metals in a closed furnace or chamber, the hearth of which is connected with molds into which the fused metal flows by gravitation, and is cast into any desired form, and in both of which (molds and furnace) the air has been rarefied as far as practicable through exhaustion by air pumps or other mechanical means.

The apparatus includes a long, air-tight smelting channel or chamber, the hearth of which inclines to a central orifice, through which the fused metal passes into the molds. This chamber is filled with the metal to be smelted, and heat is generated by passing an adequate current of electricity through the mass without the use of any kind of fuel, or the employment of carbon electrodes. In this latter respect the inventor of this process claims that it is entirely original and distinct.

The furnace is lined with glazed fire bricks, which are so efficient a non-conductor as to insulate quite perfectly the contents of the chamber, so that the heat is developed where it is required evenly throughout the mass, and very little, if any, loss of current is experienced. From the testimony of experts who have examined this process in operation, it appears that a degree of heat sufficient to smelt pig iron in 15 minutes can be generated and maintained without unduly heating the other parts of the circuit, and this is equally true of the smelting of easily fused metals, like lead and zinc, and of Siemens-Martin steel of Swedish origin.

The entire absence of coke, coal, or carbon electrodes secures to the fused metal nearly absolute purity, and the continued exhaustion of air and the gases generated by smelting increases the fluidity of the molten material and wholly prevents oxidation and blistering and produces castings of a dense, smooth quality, which have shown, under elaborate tests made by unimpeachable authority, the highest mechanical qualities of which cast-iron is capable.

The record of actual results with this process are reported to be:

1. It has been shown that by this process a degree of heat sufficient to smelt a ton or more of iron within fifteen minutes may be generated, sustained and applied at will without the use of carbon electrodes and without excessive heating or injury to other portions of the circuit.

2. Castings of iron and steel, up to a weight of 200 pounds or more, have been made, which have shown all the desirable qualities — smoothness of surface, fineness of texture and freedom from much of the impurities which are always more or less incident to smelting by ordinary methods.

3. Pig iron of excellent quality has been produced in small quantities by direct smelting from Swedish ores. The tests of this iron, as made by the Royal School of Mines at Berlin, have been published in several technical journals. These tables may be summarized in the statement that the tractile strength of a round rod 10 millimeters in diameter was 3,410 pounds, and the resistance to compression of a rod 301 millimeters in length and 30 millimeters in diameter was 57,850 kilograms, or 127,270 pounds.

How the Congressmen Viewed the Electrical Unit Bill.

[From the Washington Post.]

House bill No. 6,500, which passed the House without a dissenting vote, though not, as we shall show, without misgiving and suspicion on the part of certain members, is now in the Senate awaiting final action. It is a very useful measure, being intended to define and establish the units of electrical measure, and, therefore, to bring the United States into harmony with the other nations of the world as regards this very important science. The question of an international agreement was agitated at the World's Fair in Chicago, and subsequently by an electrical congress held in Europe, and the bill to which we refer is simply part of the general scheme looking to a uniform standard everywhere. We assume that it will become a law. The country would be placed at a serious disadvantage otherwise. And unless the scientists of the Senate prove more refractory than did the scientists of the House, all will be well.

We would not have our readers infer that any real opposition was offered in the House of Representatives. As a matter of fact the bill went through without a formal protest, and certainly without a hostile vote. There is, indeed, no record of the smallest controversy in the premises, and but for current gossip, we should not have known that the measure was at any time in question. Scientific men, however, are notoriously contentious, jealous of their opinions, dogmatic and pugnacious, and it caused us but little surprise to hear the rumor that at one time the Hon. Joseph W. Bailey, of Texas, harbored grave doubts as to the propriety of the second section of the bill, which runs as follows:

"The unit of current shall be the international ampere, which is one-tenth of the unit of current of the centimeter-gram-second system of electro-magnetic units, and is the practical equivalent of the unvarying current, which, when passed through a solution of nitrate of silver in water in accordance with standard specifications, deposits silver at the rate of 1-118,000 of a gram per second."

Whether he was opposed to any partial or half-way legislation relative to silver, or whether he stood on abstract scientific grounds as to the definition of the ampere, is not clearly known. Rumor has it, however, that he hesitated and that for some little time the international ampere was threatened with retrenchment and reform in their most formidable shape.

It is currently reported, also, that the Hon. T. J. Hudson, of Kansas, was especially concerned as to the clause defining "force," in several of the terms of which he thought he detected hostile and sinister allusions. The clause runs thus:

"The unit of electro-motive force shall be the international volt, which is the electro-motive force that, steadily applied to a conductor whose resistance is one international ohm, will produce a current of an international ampere, and is practically equivalent to one thousand fourteen hundred and thirty-fourths of the electro-motive force between the poles or electrodes of the voltiac cell known as Clark's cell, at a temperature of fifteen degrees centigrade, and prepared in the manner described in the standard specifications."

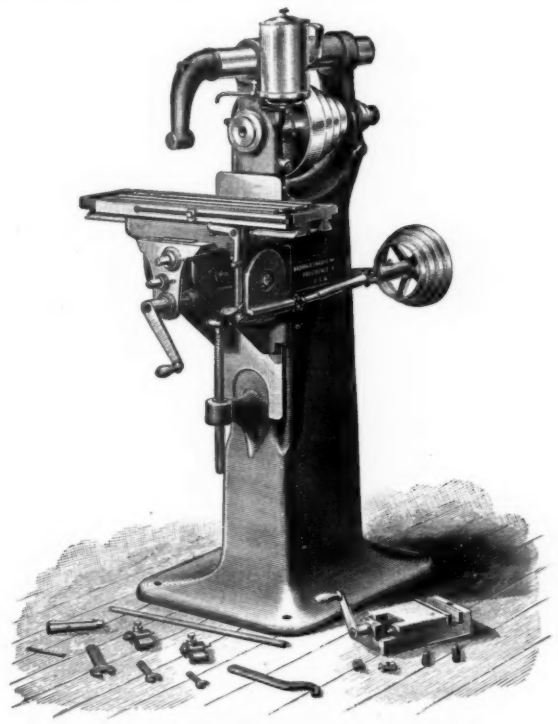
Mr. Hudson did not see how he could, in view of the interests of his clients, Messrs. Jake Coxey and Carl Browne, assent to a recognition of cells of any kind, at least just at that particular time. It looked to him like a direct thrust at the commonweal and a somewhat violent repudiation of the reincarnation.

It is fortunate that these and other misgivings were overcome, for, once set in motion, there is no telling where or when the controversy would have stopped. Hon. John Allen, of Mississippi, would infallibly have made a speech on clause seven, which reads:

"The unit of power shall be the watt, which is equal to 10,000,000 units of power in the centimeter-gram-second system, and which is practically equivalent to the work done at the rate of one joule per second."

Mr. Allen knows something about joules. He has sampled them in every part of the country, and he is familiar with their characteristics and properties. It is generally understood that Mr. Allen is good for one joule every fifteen minutes during the afternoon, provided the mint is fresh and the company congenial, but his friends do not believe that he will agree to the one joule per second claimed for Watt, or, indeed, yield the championship to anyone without a struggle.

As we say, however, the bill has now weathered all possible storms in the House, and has reached the serene harbor of the Senate. Let us hope that no further vicissitudes await it, and that the eloquence of the grave and reverend seigniors in that body will be lavished on something more in their line of thought and comprehension.



BROWN & SHARPE'S PLAIN MILLING MACHINE.

The Brown & Sharpe Manufacturing Company's Plain Milling Machine.

This is one of a series of machines, so that the following description is applicable in general (except as far as dimensions are concerned) to larger plain milling machines. There is also a series of universal milling machines. In those, however, the table is fed at an angle to the axis of the spindle, and there is provision for automatically cutting spirals.

The plain machines are the more simple and, consequently, comparatively low priced, and as the table is not swiveled it can rest directly upon the knee or other support, and the machine is stiffer and can take a heavier cut, or accomplish more work in a given time. This machine presents a number of new features, chiefly in connection with the feed.

It is made with the intention that it shall be the best machine of its size. The straight bearings are scraped to surface plates; the cylindrical bearings are ground and fitted to standards; the feed and elevating screws are accurately cut and the alignments are correct. In almost every respect, by manufacturing in large numbers with expensive special tools and by enforcing a thorough system of inspection, we have attained much greater accuracy than can be reached by the usual methods of manufacture.

The spindle has a hole its entire length and runs in bronze boxes provided with means of compensation for wear. The front end is threaded and has a hole fitted for arbors with taper ½″ per foot and 90″ diameter at the small end. The cone has 4 steps, the largest 10″ diameter, for 2¼″ belt. The overhanging arm can be easily reversed to receive an attachment, turned out of the way or removed. The distance from the center of the spindle to the arm is 4¾″; greatest distance from end of spindle to center in arm, 10½″.

The table, including oil pans and channels, is 25″ long, 8″ wide and has a working surface 20″ x 6″. It also has 3 T slots ½″ wide, a transverse movement of 4¼″ and can be lowered 12″ from center of spindle. The feed of table, 16″, is automatic in either direction and there are 8 changes of feed varying from .005″ to .100″ to one revolution of spindle.

Adjustable dials, graduated to read to thousandths of an inch, indicate the transverse and vertical movements of the table, and these dials may be adjusted without the aid of wrench or screw driver.

The frame is hollow and fitted as a closet to hold the small parts that accompany the machine. On the left side there is a pan for holding small tools, etc., and on the front of this there is a rack for wrenches.

The vise has jaws 5⅛″ wide, 1⅛″ deep and will open 2¾″. The counter-shaft has tight and loose pulleys 12″ in diameter for 2½″ belts, and should run about 180 revolutions per minute. The weight of the machine, ready for shipment, is about 1,085 pounds and the net weight about 770 pounds. The floor space occupied is 41″ x 35″.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JUNE 20, 1894.

521,455 Electric railway signal; Charles R. Alsop, Middletown, Conn., assignor to Lucy C. Alsop, same p'ace.

521,456 Erasing attachment for phonographs; Edward H. Emet, Chicago, Ill.

521,461 Combined annunciator and springjack; Henry M. Fisk, Chicago, Ill.

521,514 Telephone switch; Alfred Stromberg and Andrew Carlson, Chicago, Ill.

521,516 Lamp lighter; Albert H. Todd, Senatobia, Miss.

521,550 Printing telegraph; Edwin Pope, Quebec, Canada.

521,551 Apparatus for starting gas engines; John W. Raymond, San Francisco, Cal.

521,553 Electric railway signal; Barney Samuels, St. Joseph, Mo.

521,562 Conduit electric railway; Thomas Arnot, Washington, D. C.

521,594 Electric belt; Erastus M. Miles, Chicago, Ill.

521,602 Trolley pole catcher; Owen G. Gates, Jr., St. Louis, Mo.

521,651 Electric railway car motor; John C. Henry, Westfield, N. J.

521,666 Alternating current regulator; Olof Offrell, Middletown, Conn., assignor to the Schuyler Electric Co. of Connecticut.

521,669 Coupling for electric locomotives; Edward D. Priest, Lynn, assignor to the General Electric Co., Boston, Mass.

521,671 Armature for dynamo electric machines; Edwin W. Rice, Jr., Schenectady, N. Y., assignor to the General Electric Co., of New York.

521,684 Meter for recording measurements of electric power. 521,685 Electric meter; Elihu Thomson, Swampscott, assignor to General Electric Co., Boston, Mass.

521,711 Supply system for electric railways; Thomas Harris, Detroit, Mich.

521,721 Electric lamp for bicycles; Geo. Mayr, Brooklyn, assignor of one-half to Elihu Farmer, New York, N. Y.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Electric Light and Power.

NEW YORK, N. Y.—Dobb's Ferry Light, Heat and Power Company; capital, $150,000. Incorporated by Geo. C. Todd and others. This company is a consolidation of the Irvington and Greenburg Gas Company and the Dobb's Ferry Lighting Company.

SCOTLAND NECK, N. C.—Address S. F. Dunn concerning electric light plant he intends establishing.

QUITNAM, GA.—Address Mayor concerning $20,000 worth of bonds for electric light plant.

NASHVILLE, TENN.—Cumberland Electric Light and Power Company will enlarge its electric plant.

PENSACOLA, FLA.—Citizens' Electric Light and Power Company; capital, $20,000. Incorporated by T. E. Welles and others. Will erect electric light and power plant.

ALEXANDRIA, LA.—Address City Clerk concerning electric lighting contract, for which bids will soon be invited.

BERKELEY, CAL.—Berkeley Electric Lighting Company; capital, $100,000. Incorporated by Walter E. Sell and others.

NORWAY, MICH.—The Citizens' Electric Light and Power Company has been incorporated with a capital of $10,000.

BRINTON, PA.—The Westinghouse Electric Company, at Pittsburgh, will erect 150 dwellings for employés at this place.

SPRINGFIELD, MASS.—Address City Clerk concerning contemplated erection of $80,000 electric light plant.

CUBA VILLAGE, N. Y.—Address Town Clerk concerning contemplated electric light plant.

VICKSBURG, MISS.—Vicksburg Electric Transit and Light Company will erect an electric light plant.

BALTIMORE, MD.—Address Hon. F. C. Latrobe, Mayor, concerning electric lighting contract for a period of five years.

ST. BERNARD, OHIO.—Address H. J. Witte concerning contemplated electric light plant.

CUTHBERT, GA.—Address R. L. Moye concerning contemplated electric light plant.

New Electric Railways.

BRADFORD, PA.—The Bradford Electric Railway Company; capital, $100,000. Incorporated by Louis Emery, Jr., and others.

BALTIMORE, MD.—The City Passenger Railway Company will shortly begin the extension of its electric road to Clifton, Md.

JACKSON, TENN.—The Jackson and Suburban Street Railroad Company will be reorganized and the motive power changed to electricity. Address P. J. Murray.

ALVIN, TEX.—Address W. A. Rowan concerning the construction of an electric railroad to Velasco.

NEW ORLEANS, LA.—The St. Charles Street Railway Company will change its motive power to electricity and has applied for franchise.

NASHVILLE, TENN.—The Nashville Traction Company incorporated by Francis W. Hunter and others.

CRISFIELD, MD.—Address Mayor concerning proposed electric railroad.

TERRE HAUTE, IND.—Terre Haute Electric Railway Company; capital, $500,000. Incorporated by Paris T. Thomas and others.

PHILADELPHIA, PA.—A charter has been granted to the Roxborough, Chestnut Hill and Norristown Traction Company, of Philadelphia; capital $5,000. The incorporators are William H. Heulings, Jr., John T. Dunlap, William J. Ferdinand, Henry C. Esling, of Philadelphia, and George W. Vanhorn, of Chester.

New Manufacturing Companies.

CHICAGO, ILL.—Columbia Motor Company; capital, $1,000,000. Incorporated by Walter E. Sparks and others.

PEORIA, ILL.—The Diamond Electric Company; capital, $60,000. Incorporated by John H. Francis and others.

NEW YORK, N. Y.—The Solar Arc Lamp Company; capital, $25,000. Incorporated by Jacob Rice and others. Will manufacture arc lamps, electrical appliances and machinery.

PLAINFIELD, N. J.—Bi-Metallic Electric Transmission Company, incorporated; capital, $100,000.

NEW ORLEANS, LA.—The New Orleans Construction Company has been incorporated; capital, $50,000. Will do electrical and other construction.

NEW ORLEANS, LA.—Louisiana Auxiliary Fire Alarm Company, Limited, incorporated with a capital of $100,000 for the manufacture of electrical apparatus, etc.

NEW HAVEN, CONN.—The Connecticut Electrical Company, capital, $10,000, has been organized to operate telegraph, telephone, electric light and power lines.

ALLENTOWN, PA.—A charter has been granted to the Carbon Manufacturing Company, with a capital of $10,000.

New Telephone Companies.

WICHITA, KAS.—The Mutual Telephone Company; capital, $100,000. Incorporated by Geo. W. Dixon and others.

CHESTER, S. C.—The Chester Telephone Company has been organized and will construct a telephone system.

OCALA, FLA.—Address Mayor concerning company organizing to build and operate telephone line.

Changes of Capital.

CHICAGO, ILL.—Sperry Electric Company certified to a decrease in its capital from $100,000 to $10,000.

NEW YORK, N. Y.—United Electric Light and Power Company; capital increased from $3,000,000 to $6,000,000.

Business Troubles.

NEW YORK CITY.—Goodwin & Swift, builders of electric and surface railroads, promoters and bankers, of 66 Broadway, made an assignment on June 18 to Arthur E. Walradt, of Deming & Walradt, lawyers, of 11 William street, without preference. The liabilities are stated to be between $500,000 and $750,000, and the assets large, but not immediately available. The partners are Wendell Goodwin, of this city, and Frederick Swift, of New Bedford. Mr. Walradt said that the assignment was made to protect the properties of the firm. They could not meet maturing obligations and had become so much involved that, under advice of counsel, they made a general assignment without preference, in order to keep the various properties together. He felt confident that, if extensions could be obtained on maturing obligations, the properties could be worked out so that everyone would be paid in full.

BOSTON, MASS.—Nathaniel W. T. Knott, resident of Cambridge and dealer in gas and electric fixtures and lamps at 29 Bromfield street, this city, owes about $11,000, and has for assets the stock at the Boston store. He makes an offer of 12½ per cent in compromise, payable in 30 days.

NORWALK, CONN.—An application has been made by trustees of the bondholders for the appointment of a receiver for the Norwalk and South Norwalk Electric Light Company, whose property is under mortgage of $50,000, not including a floating debt of $30,000. The earnings of the company enable it to pay interest, but are not sufficient to enable it to pay its debts.

GAZELLE LIGHT ROADSTER.

Warranted thoroughly high-grade. Weight, with wood rims, 28 pounds; with steel rims, 30 pounds. Geared to 64 inches. Price, $70. Terms 60 days net or 5 per cent discount for cash; or if $5.00 is sent in with the order, to insure freight, we will ship C. O. D. making a cash discount of 10 per cent in place of 5, giving you the privilege of examining the wheel before paying the agent.

It is unquestionably the best, strongest and most scientifically built wheel on earth.

COLUMBIA CARRIAGE & CYCLE CO.,
Broadway and Huron Sts., Milwaukee, Wis., U. S. A.

GOOD PATENTS
Procured in all countries at moderate rates.
GRANT INSURED.
30 years' practice. Reliable and prompt service. Pamphlet and advice FREE. Write
CHAS. J. GOOCH,
Patent Attorney, Washington, D. C.

SEND FOR THE NEW BOOK.
ELECTRICITY UP TO DATE.
By JOHN B. VERITY. 75 Cents.
ELECTRICAL REVIEW PUBLISHING CO.,
13 PARK ROW, NEW YORK.

BOLGIANO'S
New Electric Fan Water Motor.
Current free as it connects with any faucet.
SAMPLE, $6.00.
WHOLESALE AND RETAIL.
THE BOLGIANO MFG. CO.,
415 Water Street,
BALTIMORE, MD.

THE CORRESPONDENCE SCHOOL OF TECHNOLOGY,
CLEVELAND, OHIO.
Correspondence Instruction in Electricity, Steam and other Engineering Branches, by E. P. Roberts, M. E., and Nine other Specialists.

Dynamos and Motors AND PARTS OF SAME
ALL KINDS PRICES OF PARTS TELEPHONES
ELECTRICAL SUPPLIES
SEND STAMP FOR CATALOGUE PALMER BROS. MANUS, CONN.

C. F. SPLITDORF,
MANUFACTURER OF
ELECTRO-MAGNETS,
Insulated Electric Wires.
(Armature and Magnet Winding a Specialty.)
17-27 Vandewater St., New York.

FOR SALE.
A new IRON BUILDING for immediate shipment, 81 ft. wide, 200 ft. long, consisting of a main span 61 ft. wide with lean-to on one side 20 ft. wide.
The trusses are sufficiently strong to carry a line of shafting and light jib crane.
This building is suitable for a Machine Shop, Tin Plate Mill, Rolling Mill, etc. For further information, address
SHIFFLER BRIDGE CO.,
Pittsburgh, Pa.

BEST FOR ALL
Electrical Work
PATENT PERFORATED
ELECTRIC
LEATHER BELTING
CHARLES A. SCHIEREN & CO.,
Patentees and Sole Manufacturers.
47 Ferry Street, New York.
226 No. Third Street, Phila.
46 So. Canal Street, Chicago
119 High Street, Boston.

ILLUSTRATED ELECTRICAL REVIEW

A Journal of Scientific and Electrical Progress.

VOL. XXV.—No. 12. NEW YORK, WEDNESDAY, SEPTEMBER 19, 1894. TEN CENTS A COPY. THREE DOLLARS A YEAR.

Copyright, 1894, by ELECTRICAL REVIEW PUB. Co.

EUGENE F. PHILLIPS, Prest. W. A. HATHAWAY, Treas. W. H. SAWYER, Secy.

AMERICAN ELECTRICAL WORKS,

PROVIDENCE, R. I.

BARE AND INSULATED ELECTRIC WIRE,

ELECTRIC LIGHT LINE WIRE,

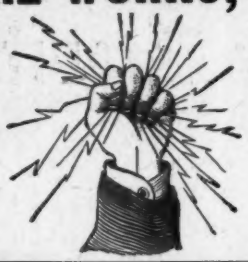
INCANDESCENT AND FLEXIBLE CORDS,

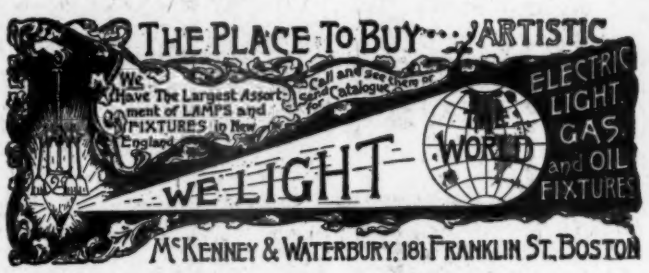
RAILWAY FEEDER AND TROLLEY WIRE,

AMERICANITE, MAGNET, OFFICE AND ANNUNCIATOR WIRES.

CABLES FOR AERIAL AND UNDERGROUND USE.

NEW YORK OFFICE, P. C. Ackerman, 10 Cortlandt St.
CHICAGO OFFICE, F. E. Donohoe, 241 Madison St.
MONTREAL BRANCH, Eugene F. Phillips' Electrical Works.




THE PLACE TO BUY ARTISTIC
We Have The Largest Assortment of LAMPS and FIXTURES in New England
Call and see us or send for Catalogue
WE LIGHT THE WORLD
ELECTRIC LIGHT GAS and OIL FIXTURES
McKENNEY & WATERBURY, 181 FRANKLIN ST. BOSTON

WATERPROOF

Wall Receptacle No. 15

— FOR —

ANY STYLE OF LAMP BASE.

The LATEST and BEST in Sockets.

Send for Catalogue A illustrating this and our other new and important specialties.

HAMMOND CLEAT & INSULATOR CO.,

15 Custom House St., Boston, Mass.

EDDY MOTORS

AND

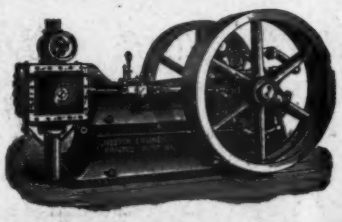
POWER GENERATORS.

EDDY ELECTRIC MANUFACTURING CO.,

WINDSOR, CONN.

1212 Havemeyer Bldg., NEW YORK. 1417-1418 Monadnock Bldg., CHICAGO, ILL.
170 Second St., PORTLAND, ORE. 30 Oliver St., BOSTON, MASS.
506 Commerce St., PHILADELPHIA, PA. Cuyahoga Bldg., CLEVELAND, OHIO.
135 Seneca St., BUFFALO, N. Y.

WESTON ENGINES.



High Pressure Boilers.
Complete Power Plant.
Estimates and Drawings Submitted.

WESTON ENGINE CO.,
PAINTED POST, N. Y.

REPRESENTATIVES:

JULIAN SCHOLL & CO., 126 Liberty St., New York City.
HOFFMAN-RUSSELL CO., 82 Lake St., Chicago, Ill.
H. M. SCIPLE & CO., 34 & Arch Sts., Philadelphia, Pa.
SCRANTON SUPPLY & MACHINERY CO., Scranton, Pa.

THE

Partridge Carbon Company,

MANUFACTURERS OF

Motor and Generator Brushes

OF ALL KINDS.

Send For Sample.

SANDUSKY, - OHIO.

HIGH EFFICIENCY FINE WORKMANSHIP

— CENTURY INCANDESCENT LAMPS —

THE CAMPBELL ELECTRICAL SUPPLY CO. BOSTON, MASS.

LONG LIFE LOW PRICES

THE **16** C.-P. IN BARREL LOTS, **25c.**

NEW BEACON

INCANDESCENT LAMP.

N. & O. PATENTS

BEACON VACUUM PUMP & ELEC'L CO.

HEADQUARTERS:
IRVINGTON ST., BOSTON, MASS.

NEW YORK OFFICE, 39 Cortlandt St.
PHILA. OFFICE, 305 Hale Bldg.
CHICAGO OFFICE, 325 Dearborn St.

N. I. R.

WIRES AND CABLES.

NATIONAL INDIA RUBBER CO.

FACTORY & GENERAL OFFICES, BRISTOL, R. I.

FREDERICK S. MINOTT, Genl. Manager.

BRANCH OFFICES:
NEW YORK: 457 Broadway, H. L. Burdick, Manager.
SAN FRANCISCO: 577 Market Street.
CHICAGO: Metropolitan Electric Co., 126 & 128 Fifth Ave.

CORRUGATED AND STEEL ROOFING.

"GLOBE"

Steel, Standing Seam, V Crimped and Corrugated.

ALL GAUGES AND LENGTHS.

Large Stock and Prompt Shipments.

THE GLOBE IRON ROOFING CORRUGATING COMPANY

OKONITE

TRADE MARK

THE INTERNATIONAL OKONITE CO. LIMITED, 13 PARK ROW, NEW YORK.

SEND YOUR BOOK ORDERS TO THE ELECTRICAL REVIEW, 13 PARK ROW, N. Y.

DRY BATTERIES

BEST OF ALL IS THE "STANDARD."

Made by J. H. BUNNELL & CO., 76 Cortlandt Street, New York.

Best Construction and Ingredients, Strongest, Most Durable and Reliable. Size, 6x2½. 60 cents per Cell. Liberal Discounts.

INSULATED WIRES AND CABLES.

DAY'S K-RITE

OFFICE, 203 BROADWAY, NEW YORK.